

United States
Circuit Court of Appeals

For the Ninth Circuit.

Transcript of Record.

(IN THREE VOLUMES.)

WILSON & WILLARD MANUFACTURING
COMPANY, a Corporation,

Appellant,

vs.

UNION TOOL COMPANY, a Corporation, ED-
WARD DOUBLE, ROSA EICHENHOFER,
as Administratrix of the Estate of FRIED-
RICH EICHENHOFER, Deceased, and
GEORGE L. CHADDERDON,

Appellees.

VOLUME I.

(Pages 1 to 320, Inclusive.)

Upon Appeal from the United States District Court
for the Southern District of California,
Southern Division.

Filed

MAY 13 1917

United States
Circuit Court of Appeals
For the Ninth Circuit.

Transcript of Record.
(IN THREE VOLUMES.)

WILSON & WILLARD MANUFACTURING
COMPANY, a Corporation,

Appellant,

vs.

UNION TOOL COMPANY, a Corporation, ED-
WARD DOUBLE, ROSA EICHENHOFER,
as Administratrix of the Estate of FRIED-
RICH EICHENHOFER, Deceased, and
GEORGE L. CHADDERDON,

Appellees.

VOLUME I.
(Pages 1 to 320, Inclusive.)

Upon Appeal from the United States District Court
for the Southern District of California,
Southern Division.

INDEX TO THE PRINTED TRANSCRIPT OF RECORD.

[Clerk's Note: When deemed likely to be of an important nature, errors or doubtful matters appearing in the original certified record are printed literally in italic; and, likewise, cancelled matter appearing in the original certified record is printed and cancelled herein accordingly. When possible, an omission from the text is indicated by printing in italic the two words between which the omission seems to occur.]

	Page
Affidavit of Service.....	1035
Amended Answer of Defendant.....	18
Assignment of Errors.....	1018
Attorneys, Names and Addresses of.....	2
Certificate of Clerk U. S. District Court to Transcript of Record.....	1039
Citation	1
Bill of Complaint.....	4
Bond on Appeal.....	1032
Decree, Interlocutory	66
Interlocutory Decree	66
Memorandum Decision	44
Names and Addresses of Attorneys.....	2
Notice as to Taking Testimony.....	74
Opinion	44
Order Allowing Appeal.....	1016
Order Extending Time to January 1, 1917, to File Record	1041
Order Extending Time to February 1, 1917, to File Record	1042
Order Extending Time to April 1, 1917, to File Record	1043
Order Extending Time to May 1, 1917, to File Record, etc.	1045

	Index.	Page
Order Extending Time to May 15, 1917, to File Record, etc.		1046
Order for Transmission of Exhibits to United States Circuit Court of Appeals for the Ninth Circuit		1011
Petition for Order Allowing Appeal.....		1013
Praecipe Under Rule 75.....		1037
Proof for Final Hearing on Behalf of Defend- ant		120
Stipulation for Substitution of Amended An- swer		17
Subpoena ad Respondendum		15
TESTIMONY ON BEHALF OF COM- PLAINANTS:		
BAILEY, H. G.....		424
BARNES, CHAS. P.		117
Cross-examination		119
BOLE, ROBERT E. (In Rebuttal).....		810
Cross-examination		813
BROWN, CHESTER W. (In Rebuttal) ..		538
Cross-examination		540
BUFFINGTON, CHARLES A.		986
Recalled		995
CASE, GEORGE L.		446
CRAWFORD, CLAUDE		434
CULVER, JOHN S. (In Rebuttal)		449
DINGER, W. S.		990
DOUBLE, EDWARD		113
Recalled.....		955
FISH, FRED L. (In Rebuttal).....		497

Index.

Page

TESTIMONY ON BEHALF OF COM-
PLAINANTS—Continued:

FRAMPTON, S. S.	427
FRAMPTON, T. M.	435
Recross-examination	441
GRAY, R. E. (In Rebuttal)	499
GRIFFIN, THOMAS J.	94
Redirect Examination	110
In Rebuttal	549
Cross-examination	600
Recross-examination	662
HENAGE, W. G. (In Rebuttal)	517
HILL, W. M. (In Rebuttal)	531
JACKSON, JAMES (In Rebuttal)	514
KEISER, C. L. (In Rebuttal)	443
KELLEY, JAMES W.	669
KENNEDY, A. P. (In Rebuttal)	510
KNIGHT, ARTHUR P. (In Rebuttal) ...	672
Cross-examination	744
Redirect Examination	802
KRAMER, JAMES	451
LYON, FREDERICK S.	989
McCRAY, E. L. (In Rebuttal)	529
MADDREN, H. H. (In Rebuttal)	525
OFF, CHARLES S. (In Rebuttal)	533
PEET, S. T.	118
ROBERTS, GEO. D. (In Rebuttal)	506
SANFORD, JOHN E. (In Rebuttal)	495
SHUPE, JOHN (In Rebuttal)	511
TEATSORTH, LOUIS	444

	Index.	Page
TESTIMONY ON BEHALF OF COM-		
PLAINANTS—Continued:		
TERRIBERRY, W. J.....		997
TOWERY, HENRY (In Rebuttal).....		507
WILLARD, ARTHUR G. (Recalled).....		423
WILLIAMSON, WILLIAM		453
Redirect Examination		456
Recross-examination		457
WILSON, E. C.....		457
Cross-examination		478
Redirect Examination		490
Recross-examination		492
YOULE, WILLIAM E.		78
Cross-examination		86
Redirect Examination		92
Recross-examination		93
YOUNGKEN, B. N. (In Rebuttal).....		542
YOUNGKEN, B. N.		987
TESTIMONY ON BEHALF OF DEFEND-		
ANT:		
BARBER, MARTIN		352
BENNETT, JOHN A.		826
BRUCE, JAMES L.		843
BUFFINGTON, CHAS. A. (Recalled)...		1005
CLAY, W. O.		818
CULVER, BERT LEWIS		235
Cross-examination		239
Redirect Examination		244
Recross-examination		247
DART, JOHN O.		348

Index.	Page
TESTIMONY ON BEHALF OF DEFEND-	
ANT—Continued:	
EASTWOOD, JOSEPH	868
Cross-examination	870
EDWARDS, WILLIAM	862
FOX, CHARLES W.	871
Cross-examination	877
HASKETT, JAMES A.	1008
JONES, FREDERICK W.	877
Cross-examination	921
Redirect Examination	932
Recalled	1003
Recalled	1006
JONES, MRS. OLIVE E.	940
Cross-examination	942
KELLERMAN, J. M.	268
KIBELE, JOHN A.	205
Cross-examination	212
KINSEY, DAVID	820
LAMB, SAM G.	857
Redirect Examination	859
LEHMAN, WILLIAM G.	394
Cross-examination	400
Redirect Examination	413
Recross-examination	415
MILLS, EDWARD L.	292
NAUGLE, WILLIAM G.	936
NORTH, EDWARD	299
Cross-examination	313
Redirect Examination	321
O'DONNELL, THOMAS A.	363

TESTIMONY ON BEHALF OF DEFEND-

ANT—Continued:

PLOTTS, WILLIAM	331
Cross-examination	333
RICHARDSON, JOHN A.	948
Cross-examination	953
RUSSELL, J. W.	866
SCHINNELLER, ALBERT	334
SHAW, J. B.	1007
SKINNER, GEORGE L.	1001
THOMPSON, JOHN	867
WILLARD, ARTHUR G.	120
Recalled	415
Recalled	420
WILLIAMS, HIBBARD S.	850
WILSON, E. C.	137
Recalled	217
Recalled	298
Recalled	417
Cross-examination	417
Recalled	1009
WILSON, W. W.	218
Recalled	251
Recalled	274
Recalled	323
Recalled	338
Recalled	420
Recalled	353
WRENN, J. BENSON	247

In the United States District Court, Southern District of California, Southern Division.

IN EQUITY—CIR. CT. No. 1540.

UNION TOOL COMPANY et al.,

Complainants,

vs.

WILSON & WILLARD MANUFACTURING
COMPANY,

Defendant.

Citation.

United States of America,—ss.

To Union Tool Company, Edward Double, Rosa Eichenhofer, as Administratrix of the Estate of Friedrich Eichenhofer, Deceased, and George L. Chadderdon, GREETING:

You are hereby cited and admonished to be and appear at a United States Circuit Court of Appeals for the Ninth Circuit, to be held at the city of San Francisco, in the State of California, on the 20th day of August, A. D. 1916, pursuant to an order allowing an appeal, entered in the clerk's office of the District Court of the United States, of the Ninth Judicial Circuit, in and for the Southern District of California, Southern Division, in that certain suit in equity, Cir. Ct. No. 1540, wherein you are complainants and appellees, and Wilson & Willard Manufacturing Company is the defendant and appellant, to show cause, if any there be, why the order or decree of said Court made and entered July 1st, 1916, against said appellant, in the said order allowing appeal mentioned, should not be corrected and

2 *Wilson & Willard Manufacturing Company*

speedy justice should not be done to the parties in that behalf. [7*]

WITNESS, the Hon. BENJAMIN F. BLEDSOE, United States District Judge for the Southern District of California, Ninth Judicial Circuit, this 26 day of July, 1916.

BLEDSOE,
United States District Judge for the Southern District of California.

Without waiving any objections as to time, etc., receipt of a copy of the within Citation is hereby admitted this 1st day of August, 1916.

FREDERICK S. LYON,
Solicitor and of Counsel for Complainants. [8]

[Endorsed]: In Equity—Cir. Ct. No. 1540. United States District Court, Southern District of California, Southern Division. Union Tool Co. et al., Complainants, vs. Wilson & Willard Mfg. Co., Defendant. Citation. Filed Aug. 1, 1916. Wm. M. Van Dyke, Clerk. By Leslie S. Colyer, Deputy Clerk. [9]

Names and Addresses of Attorneys.

For Appellant:

RAYMOND IVES BLAKESLEE, Esq., 728—
30 California Building, Los Angeles, California.

For Appellees:

FREDERICK S. LYON, Esq., 504—7 Merchants
Trust Building, Los Angeles, California.
[10]

In the District Court of the United States of America, in and for the Southern District of California, Southern Division.

IN EQUITY—C. C. No. 1540.

UNION TOOL COMPANY, EDWARD DOUBLE,
ROSA EICHENHOFER, as Administratrix
of the Estate of FRIEDRICH EICHEN-
HOFER, Deceased, and GEORGE L. CHAD-
DERDON,

Complainants,

vs.

WILSON & WILLARD MANUFACTURING
COMPANY,

Defendant. [11]

In the United States Circuit Court, in and for the Ninth Circuit, Southern District of California, Southern Division.

IN EQUITY.

UNION TOOL COMPANY, ROSA EICHEN-
HÖFER, as Administratrix of the Estate of
FRIEDRICH EICHENHOFER, Deceased,
GEORGE L. CHADDERDON, and ED-
WARD DOUBLE,

Complainants,

vs.

WILSON & WILLARD MANUFACTURING
COMPANY,

Defendant.

Bill of Complaint.

To the Honorable the Judges of the Circuit Court of the United States, in and for the Ninth Circuit, Southern District of California, Southern Division:

The Union Tool Company, a corporation organized and existing under the laws of the State of California, and having its principal place of business in the city of Los Angeles in said State, and Rosa Eichenhofer, as Administratrix of the Estate of Friedrich Eichenhofer, Deceased, George L. Chadderdon and Edward Double, residents of Los Angeles, California, and citizens of the State of California, bring this their bill of complaint against defendant Wilson & Willard Manufacturing Company, a corporation, organized and existing under the laws of the State of California, having [12] its principal place of business in the city of Los Angeles, and State of California, and a citizen of the State of California, and thereupon your orators complain and say:—

I.

That heretofore and prior to the 26th day of October, 1901, your orator Edward Double, then of Santa Paula, in the State of California, was the original, first and sole inventor of a certain new and useful underreamer, not known or used by others before his invention or discovery thereof, or patented or described in any printed publication in the United States of America, or any foreign country, before his invention or discovery thereof, or more than two years prior to his application for letters patent thereon in the United States of Amer-

ica, or in public use or on sale in the United States of America for more than two years prior to such application for letters patent therefor, and not abandoned.

II.

That said Edward Double, so being the first and sole inventor of the said underreamer, heretofore, to wit, on the 26th day of October, 1901, made due application in writing in due form of law, to the Commissioner of Patents of the United States of America, in accordance with the then existing laws of the United States of America in such case made and provided, and complied in all respects with the conditions and requirements of said laws.

III.

That all the requirements of law and of the rules of the United States Patent Office, in such case made and provided, having been fully complied with, and upon due proceedings had in said patent office of the United States, in full [13] accordance with the then existing laws and rules of the United States Patent Office, relating to the grant and issuance of letters patent for invention, and after due examination made by the Commissioner of Patents as to the novelty and patentability of the said invention, as required by law, and the aforesaid invention or underreamer having been found by the Commissioner of Patents to be new, novel, useful and patentable under said laws and the rules of the United States Patent Office, on the 28th day of July, 1903, Letters Patent of the United States of America numbered 734,833, signed, sealed and executed in

due form of law, and bearing date the day and year aforesaid, were granted, issued and delivered by the Commissioner of Patents of the United States of America, to the said Edward Double, whereby there was granted and secured to the said Edward Double, his heirs, legal representatives and assigns, for the term of seventeen years from and after the said 28th day of July, 1903, the exclusive right and liberty of making, using and vending to others to be used, the said underreamer throughout the United States and the territories thereof, as by said original letters patent or a duly certified copy thereof, to be here in court produced as may be required, will more fully and at large appear.

IV.

That by an instrument in writing bearing date the 4th day of February, 1902, the said Edward Double sold, assigned, transferred and set over unto the Union Oil Tool Company, its successors and assigns, an undivided one-half part of the legal title to said invention of said Edward Double in underreamers and in and to the letters patent of the United States to be granted therefor, which said instrument was duly recorded in the United States Patent Office on the 2d day of February, [14] 1903, in Liber H, 66 of "Transfers of Patents," on Page 495; as by said original instrument with the certificate of recording thereto affixed, or a duly certified copy thereof to be here in court produced as may be required, will more fully and at large appear.

That by an instrument in writing bearing date on the 16th day of January, 1903, the said Edward

Double granted to the Union Oil Tool Company, a license and liberty of making, using and vending to others to be used, underreamers embodying the said invention or improvement set forth in and secured by said letters patent numbered 734,833 and agreed in said instrument that the said Union Oil Tool Company, should have the exclusive right and liberty of making, using and vending to others to be used, underreamers embodying and containing the invention or improvement covered by the said letters patent numbered 734,833 so long as said Edward Double was connected with the said Union Oil Tool Company, as stockholder therein and an officer thereof, which said instrument was duly recorded in the United States Patent Office on the 2d day of February, 1903, in Liber H, 66 of "Transfers of Patents," on Page 496; as by said original instrument with the certificate of recording thereto attached, or a certified copy thereof, to be here in court produced as may be required, will more fully and at large appear.

That said Edward Double is now and has been continuously since the granting of the said license, a stockholder and an officer of the said Union Oil Tool Company; that by an instrument in writing bearing date the 4th day of February, 1902, the said Union Oil Tool Company sold, assigned, transferred and set over unto Friedrich Eichenhofer, George C. Gilson and George L. Chadderdon, an undivided one-half interest [15] in and to said invention of Edward Double and the said letters patent numbered 734,833, to be granted and issued therefor, which said

instrument has been duly recorded in the United States Patent Office as by said instrument, with certificate of recording thereto affixed, or a duly certified copy thereof, to be here in court produced as may be required, will more fully and at large appear.

That heretofore, to wit, on the 4th day of February, 1902, by an instrument in writing, the said Friedrich Eichenhofer, George C. Gilson and George L. Chadderdon, did grant unto the said Union Oil Tool Company, its successors and assigns, the exclusive right and liberty of making, using and vending to others to be used underreamers embodying the said invention of the said Edward Double in so far as the same was owned or held by the said Friedrich Eichenhofer, George C. Gilson, and George L. Chadderdon.

That heretofore, to wit, on or about May 25th, 1909, the said Friedrich Eichenhofer died; that at the time of the death of said Friedrich Eichenhofer he was a resident of the city of Los Angeles, county of Los Angeles, State of California; that thereafter and upon due proceedings had in the Superior Court of the State of California, in and for the county of Los Angeles, complainant, Rosa Eichenhofer, was appointed by said Superior Court of the State of California as Administratrix of the estate of Friedrich Eichenhofer, with the last will and testament of said Friederich Eichenhofer annexed; that the last will and testament was duly admitted to probate by said Superior Court in the State of California, and that said Rosa Eichenhofer has duly qualified as Administratrix of the said estate of said Friedrich Eichen-

hofer, deceased, and is now the executrix of said estate. [16]

V.

That by an instrument in writing bearing date the 7th day of November, 1903, the said George C. Gilson, sold, assigned, transferred and set over unto the said Union Oil Tool Company, all his, the said George C. Gilson's right, title and interest in and to said Letters Patent No. 734,833, and all his, said George C. Gilson's right, title and interest, claim and demand of whatsoever nature, in, under, to and by said license, contract or agreement bearing date the 4th day of February, 1902, between Friedrich Eichenhofer, George C. Gilson and George L. Chadderdon, on the one part, and the said Union Oil Tool Company on the other part, which said instrument has been duly recorded in the patent office of the United States; as by said instrument, with the certificate of recording thereto attached, or a duly certified copy thereof, to be here in court produced as may be required, will more fully and at large appear.

VI.

Your orators further show unto your Honors that the said Union Oil Tool Company, hereinbefore referred to, was a corporation organized and existing under the laws of the State of California, having its principal place of business in the city of Los Angeles, in said State, and did thereafter, to wit, on or about August 1st, 1908, by an instrument in writing, sell, assign, transfer and set over unto your orator Union Tool Company, all its right, title and interest in and to the said letters patent No. 734,833,

10 *Wilson & Willard Manufacturing Company*

and in and to the aforesaid instruments in writing and licenses hereinbefore set forth. [17]

VII.

That the said underreamer set forth, described and claimed in said letters patent No. 734,833 has gone into great and general use and has displaced all other underreamers or tools for said use from the market and become the underreamer in general use in underreaming wells, and that the exclusive rights of your orators in and under said letters patent No. 734,833 have been generally respected and acknowledged by the trade and by users of such tools, and the validity of the said letters patent, and the title of your orators thereto, have been generally acknowledged and acquiesced in by all manufacturers, the trade and users of the said tool, and save for the infringement thereof by the defendant herein named your orators have and do now enjoy and possess the exclusive right and liberty of making, using and vending the said underreamers, and but for the wrongful and unlawful acts of the defendant herein named your orators would now be in the possession and enjoyment of the exclusive right and liberty of so making, using and vending to others to be used the said invention and underreamer; and your orators further show unto your Honors that the exclusive right and liberty of making, and using and vending the said patented invention is of great value and advantage to these complainants, and your orators have been, and but for the wrongful and unlawful acts of the Defendant herein named, would be re-

ceiving great advantages, benefits and profits therefrom.

VIII.

Your orators further show unto your Honors, that all undereamers manufactured, sold or used by your orators, since the day of the date of the grant, issuance and delivery of the said letters patent, have been plainly marked by your [18] orators with the word "Patented," together with the day and date of the grant and issuance of said letters patent; and your orators further show unto your Honors that the said defendant has had full, complete and personal knowledge of, and has been notified in writing, prior to the filing of this Bill of Complaint, of your orators rights under said letters patent, and has been notified in writing that the acts of said defendant, herein referred to, in making, using and vending to others to be used underreamers embodying and containing said invention set forth and claimed in said letters patent, are in violation and infringement of the exclusive rights of your orators under said letters patent, and defendant has been requested to refrain and desist therefrom but has refused so to do, but has continued to manufacture, use and sell underreamers embodying and containing said invention set forth and claimed in said letters patent after full knowledge of the rights of your orators under said letters patent.

IX.

Your orators further show unto your Honors that since the grant, issuance and delivery of said letters patent to your orator and your orator's assignors, as

12 *Wilson & Willard Manufacturing Company*

set forth, the defendant, well knowing the facts hereinbefore set forth, and having full notice of the rights of your orators in the premises and against the will of your orators, without the license or authority of your orators or of either of your orators, and in violation of said exclusive rights and liberties granted and secured to your orators by the said letters patent, has been and is now within the Southern District of California aforesaid, constructing and using and causing to be constructed and used, underreamers containing and embodying the invention [19] set forth, described and claimed in the letters patent, and intends and threatens to continue so to do, but as to how many or to what extent exactly, your orators do not know and have not been informed, but pray discovery thereof; that by reason of said violation and infringement of the exclusive rights of your orators under the said letters patent by the said defendant, your orators have been and are being deprived of large profits and advantages which might and otherwise would accrue to the benefit of your orators, and the said wrongful infringing acts of the defendant have been and are now causing your orators great and irreparable damage; and your orators show unto your Honors that they have suffered damage thereby in the full sum of One Hundred Fifty Thousand Dollars (\$150,000) as near as your orators can now estimate the same.

X.

For as much as your orators can have no adequate relief except in this court, where matters of this kind are properly cognizable and relievable, to the end

therefor, that the defendant may, if it can, show why your orators should not have the relief hereby prayed, and make full disclosure and discovery of all the matters aforesaid, according to the best and utmost of its knowledge, remembrance, information and belief, full, true, direct and perfect answer make to all and singular the matters hereinbefore stated and charged, but not under oath, an answer under oath hereby being expressly waived.

XI.

And that the defendant may be decreed to account for and pay over unto your orators, the profits thus unlawfully derived from the violation of your orators' rights, and [20] damages sustained by your orators by reason of such violation and infringement of your orators' rights, and be restrained from any further violation of said rights, your orators pray your Honors may grant a writ of injunction, issuing out of and under the seal of this Honorable Court, perpetually enjoining and restraining the said defendant, Wilson & Willard Manufacturing Company, its officers, directors, agents, servants, attorneys and workmen, and each and every of them, from any further construction, sale or use in any manner, of said patented invention, or any part thereof, in violation of your orators' rights as aforesaid; and that the underreamers now in the possession or use of the said defendant, Wilson & Willard Manufacturing Company, or under its control, may be destroyed under order of this Court; and that your Honors upon the rendering of the decree above prayed, may assess, or cause to be assessed, in addition to the profits to be

14 *Wilson & Willard Manufacturing Company*

accounted for as aforesaid, the damages your orators have sustained by reason of such infringement, and that your Honors may increase the actual damages so assessed to a sum equal to three times the amount of such assessment under the circumstances of the willful and unjust infringement by said defendant as herein set forth; and your orators further pray that a provisional or preliminary injunction be issued out of and under the seal of this Honorable Court, enjoining and restraining the defendant, Wilson & Willard Manufacturing Company, its officers, directors, agents, servants, attorneys and workmen and each and every of them, during the pendency of this suit, from any further infringement of said letters patent, and for such other and further relief as the equity of the case may require and to your Honors may seem meet. [21]

May it please your Honors to grant unto your orators not only a writ of injunction conformable to the prayer of this bill of complaint, but also a writ of subpoena of the United States of America, directed to the said Wilson & Willard Manufacturing Company, commanding it on a day certain to appear and answer unto this bill of complaint and abide and perform such order and decree in the premises as the court may deem proper and be required by the principles of equity and good conscience.

FREDERICK S. LYON,
Solicitor and of Counsel for Complainants, 504 Merchants Trust Company Building, Los Angeles, California.

[Endorsed]: No. 1540. United States Circuit Court, Southern District of California, Southern Division. Union Tool Company, et al., Complainants, vs. Wilson & Willard Manufacturing Company, Defendant. In Equity. Bill of Complaint. Filed Feb. 7, 1910. Wm. M. Van Dyke, Clerk. Chas. N. Williams, Deputy. Frederick S. Lyon, 504-7 Merchants Trust Building, Los Angeles, Cal., Solicitor for Complainants. [22]

Subpoena ad Respondendum.

*Circuit Court of the United States, Ninth Circuit,
Southern District of California, Southern Division.*

IN EQUITY.

The President of the United States of America,
GREETING: To the Wilson & Willard Manufacturing Company, a Corporation.

You are hereby commanded, that you be and appear in said Circuit Court of the United States aforesaid, at the courtroom in Los Angeles, on the 7th day of March, A. D. 1910, to answer a bill of complaint exhibited against you in said court by the Union Tool Company, a corporation, organized and existing under the laws of the State of California, and having its principal place of business in the city of Los Angeles, in said State and Rosa Eichenhofer, as administratrix of the estate of Friedrich Eichenhofer, deceased, George L. Chadderdon, and Edward Double, residents of Los Angeles, California, the citizens of the State of California, and to do and receive what the said Court shall have consid-

16 *Wilson & Willard Manufacturing Company*

ered in that behalf. And this you are not to omit, under the penalty of Five Thousand Dollars.

WITNESS, The Honorable MELVILLE W. FULLER, Chief Justice of the United States, this 7th day of February, in the year of our Lord one thousand nine hundred and ten, and of our Independence the one hundred and thirty-fourth.

[Seal]

WM. M. VAN DYKE,
Clerk.

By Chas. N. Williams,
Deputy Clerk.

Memorandum pursuant to Rule 12, Supreme Court
U. S.

YOU ARE HEREBY REQUIRED, to enter your appearance in the [23] above suit, on or before the first Monday of March, next, at the Clerk's Office of said Court pursuant to said Bill; otherwise the said Bill will be taken pro confesso.

WM. M. VAN DYKE,
Clerk.

By Chas. N. Williams,
Deputy Clerk.

Clerk's Office: Los Angeles, California.

United States Marshal's Office,
Southern District of California.

I hereby certify, that I received the within writ on the 7th day of February, 1910, and personally served the same on the 8th day of February, 1910, on Wilson and Willard Manufacturing Company, a corporation, be delivering to and leaving with E. C. Wilson, President of the Wilson and Willard Manufacturing Company, a corporation, said de-

endants named therein, personally, at the county of Los Angeles, in said district, a copy thereof.

LEO V. YOUNGWORTH,

U. S. Marshal.

By B. H. Franklin,

Deputy.

Los Angeles, February 9th, 1910.

[Endorsed]: Original. Marshal's Doc. No. 1448. No. 1540. U. S. Circuit Court, Ninth Circuit, Southern District of California, Southern Division. In Equity. Union Tool Company, et al., vs. Wilson & Willard Manufacturing Co. Subpoena. Filed Feb. 10, 1910. Wm. M. Van Dyke, Clerk. Chas. N. Williams, Deputy. [24]

United States District Court, Southern District of California, Southern Division.

IN EQUITY—No. 1540.

UNION TOOL COMPANY et al.,

Complainants,

vs.

WILSON AND WILLARD MANUFACTURING
COMPANY,

Defendant.

Stipulation for Substitution of Amended Answer.

It is hereby stipulated and agreed by the solicitor and counsel for the complainants in the above-entitled suit in equity, that the annexed amended answer of the defendant may be filed in this suit *nunc pro tunc* in substitution for the answer originally interposed and now on file, as of the date of filing such original answer; and counsel for complainants

18 *Wilson & Willard Manufacturing Company*

acknowledges service of a copy of this amended answer as of the date of this stipulation; this stipulation not to abrogate or affect any admission or stipulation heretofore made by the parties hereto or either thereof.

Dated at Los Angeles, California, January 18, 1913.

FREDERICK S. LYON,

Solicitor and Counsel for Complainants. [25]

*United States District Court, Southern District of
California, Southern Division.*

IN EQUITY—No. 1540.

UNION TOOL COMPANY et al.,

Complainants,

vs.

WILSON AND WILLARD MANUFACTURING
COMPANY,

Defendant.

Amended Answer of Defendant.

This defendant, now and at all times saving and reserving unto itself all benefit and advantage of exception which can or may be had or taken to the errors or uncertainties or other imperfections in said bill of complaint contained, for answer thereto or unto so much of such parts thereof as said defendant is advised is, or are, material for it to answer unto, says as follows:

1. Upon information and belief, defendant denies that prior to the 26th day of October, 1901, the said Edward Double was the original or first or sole

inventor of any new or useful invention in under-reamers as alleged in said bill; says that it is not true that said alleged invention was not known or used by others before his alleged invention or discovery thereof, and not patented or described in any printed publication in the United States of America, or any foreign country before his alleged invention or discovery thereof, or for more than two years prior to his application for letters patent thereon in the United States of America; and says that it is not true that the same has not, at the time of his application for patent therefor, been in public use or on sale in the United States for more than two years prior to such application for letters patent therefor, and not abandoned. [26]

2. Defendant is not informed, except by said bill of complaint, whether said complainant, Edward Double, did on the 26th day of October, 1901, make due application in writing, in due form of law, to the Commissioner of Patents of the United States of America, in accordance with the then existing laws of the United States of America in such case made and provided; or whether he complied in all respects with the conditions and requirements of said laws, and leaves complainants to make such proof thereof as they may.

3. Defendant is not informed, except by said bill of complaint, whether due proceedings were had in said Patent Office of the United States, in full accordance with the then existing laws and rules of the United States Patent Office relating to the grant and issuance of letters patent for inventions, or whether

after due examination made by the Commissioner of Patents as to the novelty and patentability of said invention, as required by law, the aforesaid invention or underreamer was found by the Commissioner of Patents to be new or novel, or useful or patentable under said laws and the rules of the United States Patent Office; or whether letters patent of the United States of America, numbered 734,833 or otherwise numbered, signed or sealed or executed in due form of law, or bearing date the day and year above mentioned, were granted or issued or delivered by the Commissioner of Patents of the United States of America to the said Edward Double, his heirs, legal representatives or assigns, and leaves the complainants to make such proof thereof as they may; and denies that the said letters patent granted to the said Edward Double, his heirs or legal representative or assigns, for the term of seventeen years from and after the said 28th day of July, 1903, or for any other term, the exclusive right or liberty, or any right, or any liberty, of making, using or vending to others to be used, the said underreamer throughout [27] the United States and the territories thereof, or any right whatever.

4. Defendant is not sufficiently informed whether the said Edward Double, by an instrument in writing bearing date the 4th day of February, 1902, or other date, assigned or transferred or set over unto the Union Oil Tool Company, its successors or assigns, an undivided one-half or any part of the legal title to said alleged invention of said Edward Double in underreamers, and in and to the letters patent of the

United States to be granted therefor, or whether said written assignment includes the right to sue for and collect damages for the unauthorized use of said alleged invention, and leaves complainants to make such proof thereof as they may.

5. Defendant is not sufficiently informed whether the said Edward Double, by instrument in writing bearing date the 16th day of January, 1903, or other date, granted to the Union Oil Tool Company the license and liberty of making or using, or vending to others to be used, underreamers embodying the said invention or improvement, set forth in and secured by said letters patent numbered 734,833; or whether said written assignment granted to said Union Oil Tool Company any exclusive rights in said invention or patent, or any exclusive right or liberty of making, or using, or vending to others to be used, underreamers embodying and containing the invention or improvement covered by the said letters patent numbered 734,833, or whether said written assignment includes the right to sue for and collect damages for the unauthorized use of said alleged invention, and leaves the complainants to make such proof thereof as they may.

6. Defendant is not sufficiently informed whether said Edward Double is now and has been continuously since the granting of said license on the 16th day of January, 1903, a stockholder and an officer of the said Union Oil Tool Company, [28] and leaves the complainants to make such proof thereof as they may.

7. Defendant is not sufficiently informed whether

22 *Wilson & Willard Manufacturing Company*

the said Union Oil Tool Company sold, assigned, transferred or set over unto Friedrich Eichenhofer, George C. Gilson and George L. Chadderdon, or any of them, an undivided one-half interest in and to the said invention of the said Edward Double, and the said letters patent numbered 734,833 to be granted and issued therefor, or whether the said written assignment includes the right to sue for and collect damages for the unauthorized use of said alleged invention; and leaves the complainants to make such proof thereof as they may.

8. Defendant is not sufficiently informed whether the said Friedrich Eichenhofer, George C. Gilson and George L. Chadderdon, by instrument in writing dated the 4th day of February, 1902, or other day, did grant unto the said Union Oil Tool Company, its successors and assigns, the exclusive right or liberty of making, using and vending to others to be used, underreamers embodying the said invention of the said Edward Double, in so far as the same was owned or held by the said Friedrich Eichenhofer, George C. Gilson and George L. Chadderdon, or any right or liberty or in said invention or said patent; or whether said instrument was duly recorded in the Patent Office of the United States, and leaves the complainants to make such proof thereof as they may.

9. Defendant is not sufficiently informed whether said George C. Gilson, by an instrument in writing bearing date the 7th day of November, 1903, sold or assigned or transferred or set over unto the said Union Oil Tool Company, all his, the said George C. Gilson's right, title and interest in and to the said

letters patent numbered 734,833, or what right or what title the said George C. Gilson sold or assigned or transferred or set [29] over unto the said Union Oil Tool Company and leaves the complainants to make such proof thereof as they may.

10. Defendant is not sufficiently informed whether the said Union Oil Tool Company, by instrument in writing, assigned to complainant Union Tool Company all the right, title and interest in said invention or patent, or whether said written assignment includes the right to sue for and collect damages for the unauthorized use of said alleged invention, or whether said instrument was duly recorded in the Patent Office of the United States, and leaves the complainants to make such proof thereof as they may.

11. Upon information and belief defendant denies that the said underreamer set forth, described and claimed in said letters patent No. 734,833, has gone into great and general use, or great or general use; denies that the alleged rights of complainants under said letters patent No. 734,833 have been generally respected and acknowledged, or respected or acknowledged by the trade and by the users of such tools, or by the trade or by the users of such tools, and denies that the validity of said letters patent and the title of complainants thereto have been generally acknowledged and acquiesced in by all manufacturers, the trade, and users of said tool, or by the manufacturers or the trade or the users of said tool. Defendant denies that the said underreamer set forth, described and claimed in said letters patent No. 734,-

24 *Wilson & Willard Manufacturing Company*

833, has displaced all other underreamers or tools for said use from the market, and denies that the same has become the underreamer in general use in underreaming wells.

12. Upon information and belief defendant denies that save for the alleged infringement of the said invention claimed in said letters patent by the defendant herein, said complainants or any of them have and do now enjoy and possess, or have or do now enjoy or possess, the exclusive right and liberty, or any [30] exclusive right, or any liberty of making, using and vending to others to be used, or making or using or vending to others to be used, said invention and underreamer, or said invention or said underreamer. Defendant denies that said patented invention is of great value and advantage, or any value or any advantage to said complainants or any of them.

13. Defendant denies that at the time alleged in said bill of complaint, or at any time, it did make, use or vend underreamers containing and embodying the, or any, invention set forth and covered by said letters patent No. 734,833 therein sued upon, or that it has in any way infringed upon the exclusive rights, or any rights, of the complainants or any of them, or intended or intends so to infringe. Defendant denies that complainants or any of them are or have been deprived of any advantages, benefits and profits, or advantages or benefits or profits, by any wrongful or unlawful acts of said defendant, and denies that but for the wrongful and unlawful, or wrongful or unlawful, acts of defendant said complainants or any

of them would be receiving great advantages, benefits and profits, or any advantages or any benefits or any profits from said alleged invention.

14. Defendant is not sufficiently informed whether all the underreamers manufactured, sold or used by complainants since the day of the grant, issuance and delivery of said letters patent, have been plainly marked by said complainants or any of them with the word "Patented" together with the day and date of the grant and issuance of said letters patent, and leaves the complainants to make such proof thereof as they may. Defendant denies that after being requested to refrain and desist therefrom it has continued to manufacture, use, and sell, or manufacture or use or sell, underreamers embodying and containing, or embodying or containing, said or any invention set forth and claimed [31] in said letters patent.

15. Defendant denies that at any time since the grant, issuance and delivery of said letters patent No. 734,833 the defendant, well knowing the facts alleged in said bill of complaint, and having full notice of the rights of said complainants in the premises and against the will of said complainants, without the license or authority of said complainants or of either of them, and in violation of said exclusive rights or liberties, or in violation of any exclusive rights or any liberties, or in violation of any rights or any liberties, granted or secured to complainants or any of them by said letters patent, has been and is now, or at all times has been or is now, within the southern district of California, or at any other place, con-

structing and using and causing to be constructed and used, or constructing or using or causing to be constructed and used, underreamers containing and embodying, or containing or embodying the, or any, invention set forth, described and claimed in the said letters patent No. 734,833, and denies that it intends and threatens, or intends or threatens, to continue so to do.

16. Defendant denies that at any time since the grant, issuance and delivery of said letters patent No. 734,833 and prior to the filing of the bill of complaint herein it well knew or now knows, save from said bill of complaint, the facts therein stated or the claims therein asserted by complainants, and denies that at any of said times it had full or any notice of the alleged rights of complainants or any of them in the premises. Denies that defendant at any time since the grant of said letters patent, or at any time, has been or now is, within the southern district of California, or at any other place, constructing and using and causing to be constructed and used, or constructing or using or causing to be constructed or used, underreamers containing and embodying, or containing or embodying the, [32] or any, invention set forth, described and claimed in the said letters patent No. 734,833, and denies that it intends and threatens, or intends or threatens, to continue so to do.

17. Defendant denies that by reason of said alleged violation or infringement of the exclusive rights of complainants or of any rights under the said letters patent No. 734,833, by the said defendant,

said complainants or any of them have been and are, or have been or are, being deprived of large profits and advantages, or any profits of any advantages which might and otherwise would, or might or otherwise would accrue to the benefit of complainants or any of them. Defendant denies that said alleged wrongful infringing acts or any wrongful or any infringing acts of the defendant have been and are, or have been or are now causing complainants or any of them great and irreparable, or great or irreparable, or any damage; and denies that said complainants or any of them either jointly or severally have suffered damage by reason of the, or any, wrongful or infringing acts or acts of defendant in the full sum of \$100,000, or in any other sum.

18. Upon information and belief defendant says that complainants have, and each of them has, full and adequate relief at law, and that this Court as a court of equity has no jurisdiction.

19. Upon information and belief defendant says that the alleged invention, and the subject of each of the eight several claims of invention and the combinations of parts and elements specified therein, of said letters patent No. 734,833, were without patentable novelty or invention when said Double filed his application for said letters patent, as more particularly hereinafter set forth. Defendant further says that the said Edward Double was not the original, sole and first inventor or discoverer of the invention or any part thereof purporting to be [33] covered by and patented in and by the said letters patent No. 734,833, or of any material or substantial

part thereof, all as more particularly hereinafter set forth; that the said invention, and the subjects of each of said several claims of said letters patent No. 734,833, had been in public use in this country and other countries prior to said alleged invention by said Double and prior to the date of application for said letters patent No. 734,833, all as more fully hereinafter specified; that the said invention, and the subject of each of said several claims of said letters patent No. 734,833, had been on sale in this country and other countries prior to the date of said alleged invention and the date of application of said patent No. 734,833, all as more fully hereinafter specified; that the said invention and the subject of each of said several claims had been in public use in this country and other countries for more than two years before the date of said alleged invention and the date of the application for said letters patent No. 734,833, all as hereinafter more particularly specified; that the said invention and the subject of each of said several claims of said letters patent No. 734,833, had been on sale in this country and other countries for more than two years prior to the date of the alleged invention and the date of application for said letters patent No. 734,833, all as more particularly hereinafter set forth; that the said invention and the subject of each of the several claims of said patent had been disclosed in printed publications prior to the date of the alleged invention and the date of application of said letters patent therefor No. 734,833, all as more fully hereinafter set forth; that the said invention and the subject of each of said several claims of said

letters patent No. 734,833, had been patented prior to the date of application of said letters patent No. 734,833, and the subject of each of said several claims of said letters patent No. 734,833, had been disclosed in printed [34] publications more than two years prior to said date of application of said letters patent No. 734,833, all as hereinafter more particularly set forth; and that the said invention and the subject of each of said several claims of said letters patent had been patented more than two years prior to the application for said letters patent No. 734,833, all as hereinafter more particularly set forth; and defendant specifies instances of such prior invention, use, sale, publication and patenting, as hereinabove referred to, as follows, to wit:

As to letters patent as evidencing prior inventing and patenting of the alleged invention covered by said letters patent No. 734,833, and constituting the subjects of the several claims of said invention, prior to the date of application of said letters patent No. 734,833, reference is made to the following letters patent of the United States, to wit:

Number 679,384, granted to James M. Kellerman, July 30, 1901.

Number 683,352, granted to J. C. Swan, September 24, 1901.

Number 674,793, granted to Edward North, May 21, 1901.

Number 496,317, granted to Patrick H. Mack, April 25, 1893.

Number 403,877, granted to Jeremiah E. Day, May 21, 1889.

30 *Wilson & Willard Manufacturing Company*

Number 475,913, granted to Patrick Yorke, May 31, 1892.

Number 526,440, granted to J. Deisch, September 25, 1894.

Number 344,744, granted to M. A. Lloyd, June 29, 1886.

Number 647,605, granted to Charles A. Mentry, April 17, 1900.

Number 492,371, granted to Patrick H. Mack, February 21, 1893.

Number 294,302, granted to Orren Allen, February 26, 1884.

Number 439,275, granted to R. D. Hobart & M. Ahearn, Oct. 28, 1890.

Number 668,340, granted to Wm. Plotts, February 19, 1901.

Number 563,054, granted to George Palm, June 30, 1896.

Number 279,276, granted to Edward Sullivan, June 23, 1868.

Number 479,933, granted to John Carruthers, August 2, 1892.

As further instancing prior publication of said invention and of the subjects of the several claims disclosed in and patented [35] by said patent No. 734,833, reference is made to a printed book consisting of an illustrated catalogue of Oil Well Supply Company, or Pittsburg, Pennsylvania, United States of America, published by the said Oil Well Supply Company in the year 1900 and by the said Oil Well Supply Company distributed throughout the oil well fields of the United States of America and foreign

countries, and particularly to those interested in the handling, sale and operation of tools and appliances designed, and constructed for the sinking of oil wells and the extraction of oil therefrom; particular reference being made to that portion of page 117 of said printed catalogue being a pictorial representation of an underreamer displayed on said page under the caption "Underreamer Fig. 2161," and to page 82 of said printed catalogue being a pictorial representation of an underreamer displayed on said page under the captions "Austrian underreamer. Complete. Fig. 1713. Fig. 1715. Fig. 1717"; and to that portion of page 80 of said printed catalogue being a pictorial representation of an underreamer displayed on said page under the caption "Russian underreamer. Fig. 1707."

As particularly instancing the invention by another or others of the subject of said letters patent No. 734,833, and of each of the eight claims thereof, prior to the date of the alleged invention thereof, by said Double, irrespective of and apart from any of the matters and things further herein specified, and as a separate defense to the allegations of the bill of complaint herein, reference is made to letters patent No. 762,435, issued June 14, 1904, to Thomas A. O'Donnell and Arthur G. Willard, as joint inventors, upon an application filed December 8, 1899, namely, at a date and a long time prior to the date and time of application of said Double for said letters patent No. 734,833, and co-pending in the patent office with said application of said Double, whereby said O'Donnell and Willard are the true, original and joint in-

ventors and rightful patentees of the invention constituting [36] the subject of said letters patent No. 734,833, and of the eight several claims thereof.

As particularly instancing the prior manufacture, use and sale of the alleged invention patented in and by said Double Patent No. 734,833, and the subjects of the several eight claims of said letters patent No. 734,833, reference is made to an underreamer containing the subject of said letters patent No. 734,833, and the subjects of the several eight claims thereof, and which was produced, used and sold or leased, as follows, and contained in each instance likewise the invention patented and disclosed in and by said U. S. Letters Patent No. 762,435, issued June 14, 1904, to said Thomas A. O'Donnell and Arthur G. Willard, to wit:

First, a full-sized wooden model produced and completed, at the instance and order of said joint patentee O'Donnell, by Hughes Manufacturing and Lumber Company, of Los Angeles, California, during the latter part of the year 1899 or the first part of the year 1900, and shipped, at the order of said patentee O'Donnell, to Leidecker Tool Company, of Marietta, Ohio; and

Second, a full-sized working underreamer likewise embodying the invention patented in and by and disclosed by said letters patent No. 762,435, and manufactured by said Leidecker Tool Company, at said Marietta, Ohio, from and in accordance with said full-sized wooden model, at the order and instance of said patentee O'Donnell, during the latter part of the year 1899 or during the year 1900, and thereafter and

during the year 1900 and 1901 used in the Newhall oil fields near the town of Newhall, Los Angeles County, California, and in other oil fields in Los Angeles County, California, under the instructions of said patentee O'Donnell; and,

Third, a full-sized working underreamer manufactured at the order and instance of said patentee O'Donnell, and under the direction and superintendency of said patentee Willard, during the latter part of the year 1900, by the Baker Iron Works, at [37] Los Angeles, county of Los Angeles, California, and upon completion, during the latter part of the year 1900 or the first part of the year 1901, successfully operated and used for underreaming in a well of the El Moro Oil Company in the Whittier oil fields, adjacent to the city of Whittier, County of Los Angeles, California, and in other parts of said Whittier oil fields, by and under the supervision of said patentee O'Donnell; and which was subsequently successfully operated, during the year 1901, in a well at the mouth of the San Fernando tunnel in the Newhall oil fields, in the county of Los Angeles, California, by said patentee O'Donnell and one William Grant Lehman.

As further particularly instancing the prior manufacture, use and sale of the alleged invention patented in and by said Double patent No. 734,833, and of the subjects of the several eight claims of the said Double patent, reference is made to an underreamer containing the subject of said Swan letters patent No. 683,352, and which was in large numbers produced, used and sold or leased by the said Leidecker Tool Company, of Marietta, county of Washington,

State of Ohio, during the years 1899 and 1900 and 1901, and thereafter down to the present time, and which during the years 1899, 1900 and 1901 and thereafter was successfully used and operated in the oil fields of Ohio, West Virginia, Pennsylvania and California, and in the oil fields of Southern California, in and about said city of Los Angeles and the oil fields contiguous to such city, and at other places and by the following parties, to wit:

Bert Lewis Culver, of Whittier, California;

John O. Dart, of Los Angeles, California;

Columbia Oil Company at Fullerton, Orange County, California, during July, August, and the remaining portion of the year 1901 and thereafter;

Southern California Railway Company, at Olinda, Orange County, [38] California, during July and August and the remaining portion of the year 1901; and by other parties.

As further particularly instancing the prior manufacture, use and sale of the alleged invention patented in and by said Double patent No. 734,833, and of the subjects of the said eight claims of said Double letters patent, reference is made to an underreamer containing the subject of said letters patent No. 734,833, and the subject of said cut under the caption "Fig. 2161" appearing on page 117 of said illustrated catalogue of said Oil Well Supply Company, of Pittsburg, Pennsylvania, and which underreamer was in large quantities manufactured by Oil Well Supply Company, Limited, and the firm of McKenzie and Joyce, of Petrolia, Ontario, Canada, and was sold or leased by said Oil Well Supply Company,

Limited, and the firm of McKenzie and Joyce, to and used by oil well supply houses and oil well drillers and operators throughout the oil fields of Canada, Pennsylvania, Ohio, West Virginia, California, Sumatra and Borneo, during the years 1896, 1897, 1898, 1899, 1900 and 1901, and particularly by John A. Bennett, of Bakersfield, California, in the Island of Sumatra, in the years 1896, and 1897, and which was successfully used in the Midway oil field, in the County of Kern, California, by said John A. Bennett and one J. L. Bruce, of Bakersfield, California, during the years 1900 and 1901, and by other parties at other places.

As further instancing the prior manufacture, use and sale of the alleged invention patented in and by said Double patent No. 734,833, and of the subjects of the said eight claims of said Double letters patent, reference is made to an underreamer containing the subject of said letters patent No. 734,833, and the subject of said cuts Fig. 1713, 1715 and 1717 appearing on page 82, of the said illustrated catalogue of said Oil Well Supply Company, of Pittsburg, Pennsylvania, and which [39] underreamer was in large quantities manufactured by said Oil Well Supply Company, of Pittsburg, County of Allegheny, State of Pennsylvania, and by Baker Iron Works, of Los Angeles, County of Los Angeles, State of California, and others during the years 1898, 1899, 1900, 1901, and thereafter and which underreamer, known as the "Austrian" underreamer, were successfully used in large quantities in the oil fields of Ohio, West Virginia, Pennsylvania, Indiana and

California, during said last mentioned years and thereafter; and particularly by one J. M. Kellerman, of Los Angeles, California, in the Los Angeles oil fields adjacent to said city of Los Angeles, California, during the year 1898, and thereafter, and by one Bert Lewis Culver, in the Los Angeles oil fields at said Los Angeles, California, during the year 1900 and thereafter, and by others.

As further instancing the prior manufacture, use and sale of the alleged invention patented in and by said Double patent No. 734,833, and of the subjects of the said eight claims of the said Double letters patent, reference is made to an underreamer containing the subject of said letters patent No. 734,833, and the subject of said letters patent No. 734,833, and the subject of said cut "Fig. 1707" appearing on page 80 of the said illustrated catalogue of said Oil Well Supply Company of Pittsburg, Pennsylvania, and known as the "Russian underreamer" and which underreamer was in large quantities manufactured by the Bovaird and Seyfang Manufacturing Company of Bradford, McKean County, Pennsylvania, and others during the years 1896, 1897, 1898, 1899 and 1900 and thereafter, and which were used in large quantities in the oil well fields of Pennsylvania, Ohio, West Virginia, Indiana and California, and in foreign oil fields, during the years 1896, 1897, 1898, 1899, and 1900 and thereafter.

As further instancing the prior manufacture, use and sale of the alleged invention patented in and by said Double patent [40] No. 734,833, and of the subjects of the said eight claims of said Double let-

ters patent, reference is made to an underreamer containing the subjects of said letters patent No. 734,833, and the subject of said letters patent No. 679,384, granted to James M. Kellerman July 30, 1901, and which underreamer was in large quantities manufactured by said James M. Kellerman, of Los Angeles, California, and by the Union Tool Company, or its predecessors, of the complainants in this suit of equity, during the years 1899, 1900 and 1901 and thereafter, at said Los Angeles, California, and which were used by said James M. Kellerman and others, during the years 1899, 1900 and 1901 and thereafter, in the Los Angeles oil fields at said Los Angeles, California, and at Lompoc, Santa Barbara County, California, and elsewhere.

As further instancing the prior manufacture, use and sale of the alleged invention patented in and by said Double patent No. 734,833, and of the subjects of the said eight claims of the said Double letters patent, reference is made to an underreamer containing the subject of said letters patent No. 734,833, and the subject of said letters patent No. 674,793, granted to said Edward North, May 21, 1901, and which underreamer was in large quantities manufactured by said Edward North and Union Oil Tool Company, predecessors of complainants in this suit in equity, at said Los Angeles, California, during the years 1900, 1901 and 1904 and thereafter, and which was successfully operated and used, in the years 1901, 1902, 1903, 1904 and thereafter, by a large number of persons, and particularly by said Edward North at said Whittier, Los Angeles County, Cali-

fornia, in 1901, and by one J. O. Dart, in the Coalinga oil fields, County of Fresno and State of California, during the latter part of the year 1901 and the early part of the year 1902, and elsewhere, and by one Martin Barber in the Fullerton oil fields, Orange County, California, during the latter part of the year 1901 and the early part of the year [41] 1902, and elsewhere.

As further instancing the prior manufacture, use and sale of the alleged invention patented in and by said Double patent No. 734,833, and of the subjects of the said eight claims of the said Double letters patent, reference is made to an underreamer containing the subject of said letters patent No. 734,833, and the subject of said letters patent No. 668,340 granted to said William Plotts February 19, 1901, and which underreamer was in large quantities manufactured by one B. D. Tillinghast, at McDonald, County of Washington, Pennsylvania, during 1897, and from then on to the present time, and by others, and which was successfully used by said William Plotts and one Albert Schinneller, and others, at said Whittier oil fields, Los Angeles County, California, and elsewhere, in the year 1897 and from then on up to date by said William Plotts, and in the year 1900 and from then on up to date by said Albert Schinneller, and which is now in successful use in the same oil fields.

As further instancing the prior manufacture, use and sale of the alleged invention patented in and by said Double patent No. 734,833, and of the subjects of the said eight claims of said Double letters patent,

reference is made to an underreamer containing the subject of said letters patent No. 734,833, and the subject of said letters patent No. 403,877 granted to said Jeremiah E. Day, May 21, 1889, and which underreamer was in large quantities manufactured by said Jeremiah E. Day and others as follows: By said Jeremiah E. Day and one Joseph Pracy, and one Joseph Eastwood, and others, at San Francisco, County of San Francisco, California, during the years 1888, 1889 and 1890, and by one William Edwards, one J. W. Russell and one John Thompson and said Joseph Eastwood and others during the years 1892, 1893, 1894, 1895, and 1896, at said San Francisco, California, and one of which underreamers so made was successfully operated by one [42] C. W. Fox in the year 1892 in an oil well at Montague, County of Siskiyou, California, and by other and at other times elsewhere.

That a number of said underreamers herein mentioned continued to be used and successfully operated long after the issuance of said Double patent No. 734,833 and the commencement of manufacture of an underreamer known on the market as the Double underreamer, and manufactured and introduced by the Union Tool Company and its predecessor the Union Oil Tool Company, of complainants in this suit in equity, and that a number of such other kinds of underreamers herein mentioned are at the present day in successful use, and that the said underreamer patented by said Elihu C. Wilson, of the defendant company, is superior in construction and mechanical operation to the underreamer patented by and under

said Double patent No. 734,833; and that the underreamers made in accordance with said Double patent No. 734,833, were not successful in use and are not to-day used, but the underreamer marketed by the complainant company, Union Tool Company, is an underreamer which is deficient and defective in many respects in construction and operation and is only effective to any meritorious degree because its construction employs and embodies features of the invention of said Elihu C. Wilson, of the defendant company, which was patented by him as herein set forth; and that the said Double patent No. 734,833, if it covered any invention at all, or any improvement at all, covered only a slight and almost negligible improvement in the art over and with respect to the large number of underreamers introduced and in use and reduced to practice and patented before application for such Double patent was made.

20. Defendant alleges that long prior to the filing of the bill of complaint herein and prior to the 28th day of November, 1905, one Elihu C. Wilson, then of the city of Bakersfield in the state of California, was the original, first and sole [43] inventor of a certain new and useful underreamer not known or used by others before his invention or discovery thereof, or patented or described in any printed publication in the United States of America or any foreign country before his invention or discovery thereof for more than two years prior to his application for letters patent thereon in the United States of America, or in public use or on sale in the said United States for more than two years prior to such

application for letters patent therefor, and not abandoned.

21. Defendant says that said Elihu C. Wilson so being the first and sole inventor of said underreamer heretofore, to wit, on the 28th day of November, 1905, made due application in writing, in due form of law, to the Commissioner of Patents of the United States of America in accordance with the then existing laws of the said United States in such cases made and provided, and complied in all respects with the conditions and requirements of said laws.

22. Defendant says that all the requirements of law and the rules of the said United States Patent Office in such cases made and provided having been fully complied with, and upon due proceedings had in said United States Patent Office in full accordance with the then existing laws and rules of the said United States Patent Office relating to the grant and issuance of letters patent for inventions, and after due examination made by the Commissioner of Patents of the said United States as to the novelty and patentability of the said invention as required by law, and the aforesaid invention for underreamer having been found by the Commissioner of Patents to be new, novel, useful and patentable under said laws and the rules of the said United States Patent Office, on the 31st day of July, 1906, letters patent of the United States of America numbered 827,595 signed, sealed and executed in due form of law and bearing [44] date the day and year aforesaid, were granted and issued by the Commissioner of Patents of the United States of America to the said

42 *Wilson & Willard Manufacturing Company*

Elihu C. Wilson, wherein and whereby there was granted and secured to the said Elihu C. Wilson, his heirs, legal representatives, licensees and assigns, for the term of seventeen years from and after the said 31st day of July 1906, the exclusive right and liberty of making, using and vending the said underreamer throughout the United States and the territories thereof, as by said original letters patent or a duly certified copy thereof to be here in court produced, as may be required, will more fully and at large appear.

23. Defendant says that on the 18th day of July, 1907, it was duly organized and incorporated under and by virtue of the laws of the State of California and ever since has been and now is a corporation organized and incorporated under and by virtue of the laws of said State of California, and that prior to said 18th day of July, 1907, defendant had no existence corporate or otherwise.

24. Defendant says that since the said 18th day of July, 1907, it has been constructing and causing to be constructed and used, under and pursuant to the license and authority of said Elihu C. Wilson, underreamers containing and embodying the invention set forth, described and claimed by said Elihu C. Wilson in said letters patent No. 827,595, and not containing or embodying the invention set forth, described and claimed by Edward Double in letters patent No. 734,833, and that the said construction and using, and causing to be constructed and used, underreamers under said letters patent No. 827,595, pursuant to said license, are the acts complained of by

said complainants in the bill of complaint herein.

WHEREFORE, this defendant having fully answered to the said bill of complaint in so far as it is advised the same is [45] material and necessary to be answered unto, denies that the said complainants or any of them are entitled to the relief or any part thereof in the said bill of complaint demanded, or any relief whatever; prays the same advantages to its aforesaid answer as if it had pleaded and demurred to said bill of complaint, and prays to be hence dismissed with its reasonable charges in this behalf most wrongfully sustained.

WILSON & WILLARD MFG. CO.

By ELIHU C. WILSON, Pres.

RAYMOND IVES BLAKESLEE,

HUNSAKER & BRITT,

F. A. STEPHENSON,

Of Counsel and Solicitors for Defendant.

[Endorsed]: C. C. No. 1540. U. S. District Court, Southern District of California, Southern Division. Union Tool Company et al., vs. Wilson & Willard Manufacturing Company. Stipulation and Amended Answer. Filed Jan. 20, 1913, *nunc pro tunc* as of July 9, 1910. Wm. M. Van Dyke, Clerk. By Chas. N. Williams, Deputy Clerk. [46]

44 *Wilson & Willard Manufacturing Company*

*In the District Court of the United States, Southern
District of California, Southern Division.*

No. 1540.

UNION TOOL COMPANY,

Complainant,

vs.

WILSON & WILLARD MANUFACTURING
COMPANY,

Defendant.

Memorandum Decision.

Filed June 19, 1916.

FREDERICK S. LYON, for Complainant.

RAYMOND IVES BLAKESLEE, for De-
fendant.

CUSHMAN, District Judge.

Complainant sues for the infringement of letters patent #734,833, applied for in 1901 and granted Edward Double in 1903. The patent is for a new type of underreamer covering certain combinations therein. The defense is: Want of patentable novelty and invention; anticipation; and infringement is denied.

In drilling oil wells in Pennsylvania, no underreamer was necessary, as the formation stood up and, when the rock was reached, at a depth of fifty to one hundred feet, no casing was required—casing being a pipe entered in the hole for the purpose of holding back soft earth and preventing caving.

The devices in question are a part of what is known as the "cable tool system" of oil well digging, con-

sisting of a high derrick with windlasses called “bull wheels and calf wheels” for winding up and releasing the cable rope to which the tools are attached. The hole in the ground is made by dropping a string of [47] tools. A certain amount of water is kept in the bottom of the hole, which is churned up into mud. This mud—made by the water and detritus formed by the drilling—is taken out of the hole by a *baler* *other* suitable device, which is run down inside the casing.

In drilling, ordinarily, a heavy bit is used. The bit will pass literally through the inside of the pipe, but, in playing up and down beneath the pipe, unless the formation is soft, it will cut a smaller hole than the outside diameter of the pipe, or casing. In hard formations it is, therefore, necessary that the hole underneath the casing be enlarged, or underreamed, that is, reamed out under the casing so that the casing may follow through the hole.

The device for accomplishing this is an underreamer, which, in effect, is an expansive bit that is so arranged as to expand after it has been dropped through the casing. The casing is supported a sufficient distance above the underreamer to allow of its being played up and down to cut away the hard strata by the weight behind the striking bit.

The ordinary drilling bit drills a hole through the hard ledge first, but this hole is of too small a diameter to permit of the passing of the casing. The hole is then enlarged by means of the underreamer so that the casing may fall.

In order to be a successful underreamer, the ma-

chine must be essentially strong. The thrust upon the bit must be as nearly as possible in direct line with the string of tools, to prevent breaking. The mechanism by which it expands and collapses must be dependable so as not to get out of order by reason of the heavy blows, or by reason of the mud and debris in which it has to be worked. It must not only be so arranged as to expand when it is passed down through the casing, but provision must be made by which, in pulling it up against the shoe or foot of the casing, it [48] will again be collapsed so that it can be drawn within the casing.

These are the main difficulties to be overcome in such a device, and the accomplishment of them—as the evidence shows—has been sought for many years.

The digging of oil wells in California began as far back as, about, 1890. The industry increased to a great degree in importance about 1897.

Prior to the invention of the patent in suit, the underreamers mainly used in California oil fields were known as the “Austrian” and “Russian.” With these a greater depth than 1800 feet was seldom reached. By the use of the Double underreamer a much greater depth was attained, not infrequently twice as deep as formerly.

It is claimed that this great success was not entirely owing to the new underreamer, as improvements in other ~~other~~ oil well digging devices were adopted about the same time. It is clear that much of the credit for this great accomplishment, is unquestionably due to the Double underreamer. It almost at once took the lead in the oil well tool trade

over all former reamers. There is testimony that, in the California fields, eighty-five per cent of the underreamers sold are either of the Double type or that of the alleged infringing device.

These facts, coupled with the presumption arising upon the grant of the patent, are sufficient to resolve any doubt which may exist, in this case, in favor of the validity of the patent.

Stebler v. Riverside Heights Orange Growers Association, 205 Fed. 735;

Morton v. Llewellyn, 164 Fed. 693.

It is not meant by this that patentable invention is left substantially in doubt upon an inspection of the alleged anticipating devices and the evidence concerning them, for it is not.

Upon the trial, defendant sought to establish that one Frederick W. Jones—an employee of the National Supply Company, [49] under the superintendency of Double—was really the inventor of whatever was novel in the patent in suit. Jones testified that he was, in fact, the inventor but his former conduct; his long silence, even under provocation, and testimony given by him on an interference contest in the patent office involving the Double underreamer are wholly inconsistent with his present statements.

The testimony at that hearing was given about the time of the granting of the patent in suit and was, in part, as follows:

“Q. Did you have a conversation with Mr. Double in regard to this reamer; and if so state the conversation.

“A. Well, I was employed by Mr. Double at the same time he was manufacturing the reamer in question; I had a conversation with him and he said the reamer was a mean thing to manufacture and that he would change the construction of it, and he showed me what changes he proposed to make, and he also asked me what I thought of the changes, and I told him that I thought the change was a good one. That is all.”

This so far discredits the testimony of Jones as to leave no warrant for overthrowing the presumption of regularity in the issuance of the patent, as well as plaintiff's evidence now given in support of the patent.

The main question in the case is: What range of equivalents, if any, is complainant entitled—under the patent in suit to be protected against?

Upon consideration of the prior art, including the alleged anticipating patents and devices, and the marked success in the trade and in operation of the Double underreamer, I find that it constituted combinations of decided merit, entitling complainants to a fair range of equivalents.

Los Alamitos Sugar Co. v. Carroll, 173 Fed. 280.

While it is true that each of the elements of the combination claims of the patent in suit were old in the art, yet the combinations, as a whole, were new.

The claims of the patent in suit in question are [50] numbered 1, 2, 6, 7 and 8 and read as follows:

“1. An underreamer comprising a hollow mandrel furnished with an internal shoulder,

a downward extension having opposite parallel bearing-faces having a key-way therein, shoulders at the sides of such extension and upwardly and inwardly sloping dovetail slipways beneath said shoulder; a spring on the shoulder in the hollow mandrel; a rod playing in the mandrel furnished with a key-seat and supported by the spring; dovetail tilt-slips playing in the slipways and furnished with key-seats respectively; a key in the key-seats of the slips and rod and playing in the key-way of said extension to hold the slips against the shoulders; said slips being furnished with inward projections to slide upon the downward extension of the mandrel to spread apart the cutting edges of the slips when the slips are drawn up.

“2. An underreamer furnished with a mandrel having a downward extension provided with opposite parallel bearing-faces and a key-way in the extension; a spring-supported rod furnished with a key-seat and playing up and down in the mandrel; tilt-slips slidingly connected with the mandrel and furnished with inward projections to slide upon the opposite bearing-faces of the downward extension to spread the slips apart at the lower ends when the slips are drawn up; and a key carried by the rod and carrying the slips.”

“6. In an underreamer, a mandrel furnished with a hollow-slotted extension, the lower end of which slopes upward at the edges; tilt-slips slidingly connected with the mandrel and fur-

nished on their inner faces with projections, the upper faces of which slope downward to slide upon the extension of the mandrel; and means connecting the slips with the rod.

“7. In an underreamer, the combination with a hollow mandrel, provided with a slotted extension, a spring-actuated slip-operating rod provided with a pivot-key, tilt-slips provided with key-seats adapted to be engaged by said pivot-key, said key-seats being somewhat larger than the key to allow the slips to tilt, said slips provided with inwardly-projecting shoulders, and said slotted extension provided with surfaces adapted to tilt said slips and hold the same in expanded position.

“8. In an underreamer the combination of a hollow mandrel with a hollow-slotted extension, said extension having opposite parallel bearing-faces, a slip-carrying rod in said mandrel, slips connected to said rod, said slips having projections which bear against said extension, said slips being provided with key-seats, a key carried by said rod, each end of the key lying in a key-seat of a slip, and the key-seat in each slip being somewhat larger than the key to allow the slips to partake of a tilting action.”

A hollow mandrel with inner shoulder; a downward extension with shoulder at the side of the extension; a spring on the shoulder in the hollow mandrel; a rod playing in the mandrel supported by the spring, and a key at the lower end of the rod to carry the cutters were, in such combinations, all old in the

art. The chief novel feature of the Double invention was the tilting [51] means adopted for the collapse and expansion of the cutters—in combining that means with inter-related dovetails on the cutters and ways of the body extension.

In the O'Donnell & Willard Patent (#762,435), while there may be a slight tilt of the cutters, owing to the downward and inward inclination of the interposed section of the body, and the fact that, in operation, the bottom of the machine would be full of fragments of rock and other material removed in the progress downward, as well as the interior of the bowl-shape of the lower body, the action of the cutters on the key would be *sliding*, rather than *tilting*, *rocking* or *swinging*.

In the O'Donnell & Willard patent and device the face of the interposed part of the body upon which the cutters travel has but one incline, though tending to curve. The collapse of the cutters is, therefore, gradual, while, in the patent in suit, the bearing faces upon which the cutters travel are at first parallel, until the shanks are well free from their seats, when, in operative position, the collapse is then sudden to which a tilting or swinging action on the key is necessary. The same distinction is to be found in the so-called "Jones' round-nosed" reamer.

In the O'Donnell & Willard device, while there are seats in the cutters for the insertion of the key, carried by the spring-actuated rod, the periphery of the body is unbroken. While, in the patent in suit, the pocket in the body in which the shank of the cutter becomes seated opens to the outside, permitting the

shoe of the casing to contact with the shoulder on the outside of the cutter-shank above the lower end of its head or body, and, also allows of stronger body construction.

The dovetails upon the shanks of the cutters and ways, therefore, are not found in the O'Donnell and Willard patent and device.

The so-called "Jones' round nosed" reamer was a device for which no application was ever made for patent. It never was used and was abandoned by Jones. [52]

In the Jones' round-nosed reamer, the entire movement of the cutters is directed by a dovetail structure, the ways being curved inwardly and downwardly affecting a collapse; but the method of operation is entirely different in this respect from the patent in suit. There is no spreading bearing in the Jones' round-nosed reamer to assist in the expansion and collapse of the cutters.

These differences in the mode of operation appearing in both the O'Donnell & Willard device and that of the Jones' round-nosed reamer render it unnecessary to consider further whether there should have been an interference proceeding in the Patent Office as between O'Donnell & Willard and the Double applicants; or to consider whether the Jones' round-nosed reamer preceded Double's invention and whether Double was familiar with it.

In the Swan reamer (#683,352) there are inter-related dovetail ways upon the body of the reamer and inter-related dovetails upon the cutter, which dovetails and ways, likewise, appear in the patent

in suit. But the action of the cutters in the Swan device are entirely of a sliding character. There is no swing or rock, either upon the key or the shoulders or exterior angles in the lower end of the body as in the patent in suit.

In the North patent (674,793) the action of the cutters is entirely a rocking action upon the key and upon each other. There is no interposed portion of the body and the only portion of the cutters sliding is in their upper extreme contact with the inside of the bowl formation in the bottom of the reamer body.

The Brown reamer (#687,296) is, doubtless, the closest in essential principle of anything in the prior art to the patent in suit, for the cutter is adapted to both slide upon an interposed portion of the body, provided with parallel bearing faces for that purpose, and, as the cutters slide down upon this face, they collapse inwardly over the lower end of the extension, which they are enabled to do directly because of the fact that the cutters, on [53] their inside faces, are provided with a recess for the accommodation of the enlarged lower end of the body, and they are further so enabled to collapse because they hang free upon a spring actuated device in the interior of the reamer. But they are suspended—not by means of a key-seat in a recess in the shank of a cutter larger than the key, as in the patent in suit, but the upper end of the cutter-shank is formed into an inner shoulder hooked over an exterior shoulder upon a spring actuated box open at the lower end, allowing it to travel downward with the cutters, over an interposed portion of the body. The effect of this differ-

ence will be considered later in connection with the rejection of applicant's claim first presented in the Patent Office.

Defendant also avers that a certain Canadian underreamer anticipated the patent in suit. If this Canadian underreamer was patented, the evidence does not disclose that fact. An oil well supply catalogue of 1900 was introduced in evidence, containing a cut of the Canadian underreamer, but such a catalogue is not a sufficient publication to establish anticipation.

30 Cyc., 837, 3-B.

There is also some evidence of use in the California fields of this underreamer; but, without undertaking to determine the extent of this use, an inspection of the Canadian underreamer shows that its cutters slide upon the interposed body of the reamer and are, to a certain extent, allowed to collapse because of inwardly projected shoulders; yet the cutters are not equipped with shanks carrying dovetails; nor the body with pockets to seat such shanks, but the cutters rest upon, and slide entirely without the body and are not suspended from a spring actuated rod in the upper portion of the cutter body, but are locked together and hung on the top of a bolt actuated by a spring in the lower portion of the reamer body, and, as in the Brown device, this spring-actuated bolt, while it carries the cutters as it travels upward, does not, necessarily, do so as it retires downward. [54]

These differences in operation are sufficient to avoid anticipation.

None of the underreamers of the prior art com-

bine cutters tilting over the lower end of the reamer body with shanks having dovetails so inter-related with dovetail ways, upon the body of the reamer as to afford inner, outer and lateral bearings when in reaming position.

Claims numbered 1, 2 and 3, as originally proposed, were rejected by the Commissioner of Patents upon reference to the Swan patent and were only allowed upon their amendment and that of the specifications, the effect of the amendment being to make plain the tilting action of the cutters, or slips, in addition to the inter-related dovetails and dovetail ways thereof upon the cutter shanks and body extension, which latter were found in the Swan device. The effect of the amendment is made plain by an amendment required and made to the specifications and upon which the claims were allowed. This amendment is as follows:

“The sockets or key-seats 16 are somewhat larger than the key 17 to permit the slips 15 to partake of a tilting action, the key 17 thus forming a portion, on the rod 11, on which the tilt slips or bits 15 are loosely swung or pivoted, adapting their lower ends to tilt or swing in toward the center of the stock or mandrel portion to pass through the well-casing or to tilt away from the center to assume the proper position for reaming. The tilt-slips are provided with shoulders 18 adapted to slide upon a spreading portion provided in connection with the mandrel-body.”

Claim 7—originally numbered 8—in the applica-

tion was rejected by the Commissioner of Patents upon reference to the Brown patent. The claim as then presented read:

“In an underreamer the combination of a hollow mandrel, a slip-carrying rod in said mandrel, slips connected to said rod, and means for tilting said slips.”

As allowed, it reads:

“In an underreamer, the combination with a hollow mandrel, provided with a slotted extension, a spring-actuated slip operating rod provided with a pivot key, tilt slips provided with key-seats adapted to be engaged by said pivot key, said key-seats being somewhat larger than the key to allow the slips to tilt, said slips provided with inwardly projecting shoulders, and said slotted extension provided with surfaces adapted to tilt said slips and hold the same in expanded position.” [55]

Defendant insists that, by the limitation voluntarily so placed in the claim, infringement is avoided and that the language of the broad claim, as it originally stood, “and means for tilting said slips” is necessary to cover defendant’s device, and, with that language out of the patent, there is no infringement.

In the Brown patent, upon which the claim was first rejected, the means for holding the cutters in expanded position, over which they were allowed to collapse, appear the equivalents of the Double invention; but the means by which the cutters were carried on the rod were essentially different.

It is necessary that they be so freely suspended

on this rod as to permit them to tilt forward and back; over and upon the lower end of the extension. In the Brown device, this was accomplished by an inwardly projecting shoulder upon the upper extremity of the cutter, fitted or hanging upon a shelf or shoulder extending from the spring-actuated box into the cavity provided for the accommodation of the cutter shank.

In the Double device, the key carried by the rod loosely fits in the hole in the upper part of the inner face of the cutter shank. In operation, as the rod carries the cutters up into the reaming position, the cutters will travel together, for the rod, with the aid of the key inserted in each shank, would control each cutter. But as the box upon which the cutters hang in the Brown device travel downward, the cutters do not, necessarily, travel with it, save by their own weight. The expansion on the end of the rod would keep them from falling out, but it would not bring them down with it, together.

The foot of the casing, which forces the cutters down in collapsed position, might become jammed out of shape, so as not to be uniform on both sides, or rocks or other substances might get between the foot of the casing and the outer shoulder of the cutter, resulting in one cutter being carried down ahead of the other, if anything interfered with the descent of such other. [56]

This shows such a difference in the method of operation as to prevent anticipation of the Double invention by the Brown. It is, therefore, obvious that, as Brown invented one "means" and Double

another “for tilting the slips,” the Commissioner of Patents rightfully rejected Double’s broad claim to all means “for tilting the slips,” which would have included the means invented by Brown.

The remaining question: Whether the means adopted by Wilson of collapsing, expanding and holding the cutters in reaming position are equivalents, substantially the same as those of Double, must be resolved in the affirmative.

As already pointed out, the chief novelty and utility of the Double invention over the prior art was the combination of the inter-related dovetails on the cutter-shank and ways therefor on the body of the extension, with the means by which the tilting action of the cutters over the lower end of the body was accomplished.

It is insisted by the defendant that the complainant is not entitled to protection of this combination under the claims of the patent; that, while claims 1 and 2 cover the dovetail arrangement, and claims 6, 7 and 8 cover the means securing the tilting action, there is no claim covering both.

If defendant’s assumption were conceded, as long as the lesser combinations were covered by valid claims, no good reason appears—it being found that the entire combination is an invention of decided merit—for allowing only a narrow range of equivalents, although this course might be justified if each of the claims was considered entirely independently of everything else than the prior art.

Defendant’s contention in this particular is based on a false premise. Claim 1 covers both the dovetail

ways on the body, co-acting with dovetails on the slips or cutters, and means for the expansion and collapse of the cutters over the lower end of the extension. The following language of the claim covers the latter feature: [57]

“said slips being furnished with inward projections to slide upon the downward extension of the mandrel to spread apart the cutting edges of the slips when the slips are drawn up.”

It is obvious that, if the cutters spread when drawn up, they would collapse on being drawn down. That this claim not only covers the dovetail slips and ways, but such expansion and collapse of the cutters and the means for its accomplishment is further shown by the paragraph of the amended specifications above quoted, upon which amendment the Commissioner of Patents allowed claims 1, 2 and 3.

As to claims 1 and 2, it is insisted by the defendant that its forked, or pronged formation of the lower extension, rather than the hollow slotted formation of the closed bottom of the patent in suit, and the omission of the opposite parallel bearing faces on such extension so differentiates the Wilson reamer as to essentially change the mode of operation.

The feature of “opposite parallel bearing faces” is only included in claims 1 and 2 and does not appear in claim 3. The opposite bearing faces upon the prongs in the Wilson device are the equivalent of the opposite parallel bearing faces in claims 1 and 2 of the patent in suit. It is true that the former are not exactly parallel, but they are approximately so

and could be made so without affecting, materially, the function discharged by them.

In the patent in suit, the opposite parallel bearing faces extend upward the entire length of the extension to the shoulder that forms the upthrust bearing for the cutters, except as cut to afford a slot for the playing up and down of the key carrying the cutter, thus they form an inner bearing and guide for the upper end of the cutter as it travels up and down.

In the Wilson, these opposite bearing faces are not carried the entire length of the extension. This omission helps [58] to form the pronged formation which enables Wilson to give the end of the rod inserted between the upper cutter shanks a heavier construction, taking on itself the duty before, in part, performed by the upper portion of the opposite parallel faces in the patent in suit. In view of the state of the art, and particularly of the Brown patent and device, I find this would be the substitution of a well known mechanical equivalent. Therefore, no avoidance of infringement. The effect of this changed formation, from the hollow slotted extension to the pronged formation, is rather to permit of additional features and the accomplishment of further action.

The change permits the cutter shank to collapse between the prongs, which permits of more stock in the cutter shank, eliminating the notch on the inside, which is a feature of the Double cutter, above the inwardly projecting shoulder, which notch in the Double cutter is necessary to allow of the collapse of the cutter over the lower end of the extension, the

web of which is unbroken. There is testimony to the effect that this notch constitutes a weakness in the Double cutter.

This provision for the collapse of the cutter between the prongs is the chief additional function accomplished by the pronged formation, although it also permits of the assembling of the reamer from the bottom, instead of the top, and has an advantage in permitting the re-machining of the lower end of the body of the reamer. But these latter features do not affect, directly, the operation of the machine when in use. These differences may constitute improvements, warranting the issuance of patent; but substantially the same dovetails on the cutters and ways therefor, and like means for tilting the cutters remain as in the patent in suit. The principle of action—the mode of operation, is not substantially changed and infringement is not avoided by the improvements.

Stebler v. Riverside Heights Orange [59]

Growers Ass'n., 205 Fed. 735;

Lourie Imple. Co. v. Lenhart, 130 Fed. 122;

Norton v. Jensen, 49 Fed. 859.

Claim 6 reads:

“In an underreamer, a mandrel furnished with a hollow slotted extension, the lower end of which slopes upward at the edges; tilt-slips slidingly connected with the mandrel and furnished on their inner faces with projections, the upper faces of which slope downward to slide upon the extension of the mandrel; and means connecting the slips with the rod.”

It is insisted by the defendant that further substantially different means are employed in its device from the foregoing. In the foregoing claim the lower end of the hollow slotted extension, it is said, "slopes upward at the edges." This feature is one of the means in accomplishing the tilting or collapsing and expanding of the cutters.

In the Wilson reamer, the slopes are at the lower end of each prong, described in Wilson's specifications as "the beveled end faces 17 of the downwardly-projecting lugs 2' " If the prongs were joined by a web, the formation would, instead of pronged, become hollow and slotted, and the slopes of the prongs would be "at the edges" of their upward slope.

It is clear that the means and manner of discharging this function are substantially the same in each. Claim six further provides that the tilting slips shall be "furnished on their inner faces with projections, the upper faces of which slope downward to slide upon the extension of the mandrel." The projections and sloping face are numbered 18 and 26 in figures 9 and 11 of the Double drawing.

Defendant contends that, of the parts in question, the Wilson device has no clear mechanical equivalent for this downward sloping face upon an inward projection. The corresponding part in the Wilson cutter is described in the specifications, and referred to in the drawings as follows:

"The expansion bearing-faces 4³ terminate at their [60] upper ends in rounded corners or bearings 16 to ride more readily over the beveled end faces 17 of the downwardly-pro-

jecting lugs 2' to engage said bearings for expanding the cutters.

The object sought in both formations was to have the cutter slide freely in collapse and expansion up and down over the upwardly and outwardly sloping portion of the body. Infringement could, therefore, not be avoided merely by rounding the shoulders or corners in place of a straight slope—as merely to affect this purpose the rounded shoulders could not, inaptly, be described as “rounded slopes.”

It is further contended that the portion of the face of the cutters which corresponds and slides upon the lower part of the prongs is not upon a “projection.” Change in form alone, unless it substantially changes the method of operation, is not sufficient to avoid infringement. No citation of authority is necessary in support of this proposition, though there may be an exception, but the exception is not of importance in the present instance.

In one view, the rounded corners are upon the upper face of the projection for they are on a projection of the body of the cutter, as distinguished from the shank. By the pronged formation, the cutter shank could be made heavier in the Wilson than the Double and the shank projects still further inward than the projection on the body of the cutter, which carries the rounded shoulder. By cutting away the heavier portion of the cutter shank, permitted by the pronged formation—which elimination would in no way prevent the discharge of the function in question—it becomes clear that

the means and function of the parts in question are the same in both devices, although the improvement by the Wilson arrangement may justify a patent to protect the variation.

Claim 7 reads:

“In an underreamer, the combination with a hollow [61] mandrel, provided with a slotted extension, a spring-actuated slip-operating rod provided with a pivot-key, tilt-slips provided with key-seats adapted to be engaged by said pivot-key, said key-seats being somewhat larger than the key to allow the slips to tilt, said slips provided with inwardly-projecting shoulders, and said slotted extension provided with surfaces adapted to tilt said slips and hold the same in expanded position.”

Aside from what has already been considered, the only element covered in this claim to be compared with Wilson's device is the “pivot-key” with which the “spring actuated slip rod” was provided, “the key-seats” (on the tilt slips) “being somewhat larger than the key to allow the key to tilt.”

The enlarged key-seat in the Wilson is identical with that of the patent in suit. Its function is identical. While the words “pivot-key” do not disclose that the key and the rod are separate elements, yet that such was designed by Double is shown by the drawings and specifications. In the Wilson the rod and key are integral.

While this and the pronged formation of the body extension permit of a heavier and stronger key and cross-head in the Wilson device than the Double,

it does not in any way essentially affect the mode of operation by which its function is discharged, in carrying the cutters up and down and in permitting their tilting.

The elements described in claim 8 have been considered in connection with the other claims and are found to be identical, or the equivalents of like elements in the defendant's structure.

Many lesser matters have been discussed and elaborated upon by counsel, but enough has been said. I deem the lengthening of this opinion further, unwarranted.

Infringement of claims 1, 2, 6, 7 and 8 is clear. The injunctive relief prayed will be granted.

[Endorsed]: No. 1540—In Equity. In the District Court of the United States, for the Southern District of California, Southern Division. Union Tool Company, Complainant, vs. Wilson & Willard Manufacturing Company, Defendant. Memorandum Decision on the Merits. Filed Jun. 20, 1916. Wm. M. Van Dyke, Clerk. By Chas. N. Williams, Deputy Clerk. [62]

*United States District Court, Southern District of
California, Southern Division.*

IN EQUITY— CIR. CT. No. 1540.

UNION TOOL COMPANY, EDWARD DOUBLE,
ROSA EICHENHOFER, as Administratrix
of the Estate of FRIEDRICK EICHEN-
HOFER, Deceased and GEORGE L. CHAD-
DERDON,

Complainants,

vs.

WILSON & WILLARD MANUFACTURING
COMPANY,

Defendant.

Interlocutory Decree.

The above-entitled suit having come on regularly for final hearing before the Court upon the proofs taken on behalf of the respective parties, and the Court having heard the argument of Frederick S. Lyon, on behalf of complainants and Raymond Ives Blakeslee on behalf of defendant, and upon due consideration thereof:

IT IS ORDERED, ADJUDGED AND DECREED,

1. That complainant Edward Double was the original, first and sole inventor of the underreamer set forth, described and claimed in letters patent of the United States No. 734,833 granted July 28, 1903; that said letters patent are good and valid in law, particularly as to claims 1, 2, 6, 7 and 8 thereof;

that the said invention was not known or used by others before the said Edward Double's invention or discovery thereof, or patented or described in any printed publication in the United States of America or any foreign country before the said Edward Double's invention or discovery thereof, or more than two years [63] prior to the application of said Edward Double for said letters patent, or in public use or on sale in the United States of America for more than two years prior to such application for said letters patent therefor, and not abandoned; that said letters patent were issued in due form of law and after due examination made by the Commissioner of Patents as to the novelty and patentability of said invention; that by the said letters patent there was secured to the said Edward Double, his heirs, legal representatives and assigns, for the term of seventeen years from and after the 28th day of July, 1903, the exclusive right and liberty of making, using and vending to others to be used, underreamers embodying the said invention in and throughout the United States of America and the territories thereof; that the title to said letters patent is in the complainants, as alleged in the bill of complaint.

2. That immediately after the production of said invention by said Edward Double underreamers embodying the said invention went into extended general use and substantially displaced all other underreamers or tools for such use and became the underreamer in general use in California in underreaming wells; that the exclusive rights of complainants in

and under said letters patent have been generally respected and acknowledged by the trade and by users of such tools, and the validity of the said letters patent and the title of complainants thereto have been generally acknowledged and acquiesced in by all manufacturers, except the defendant herein, the trade and users of such tools, and but for the wrongful and unlawful acts of the defendant in infringement of said letters patent complainants would have been in the continued enjoyment and possession of said exclusive rights, that upon all underreamers manufactured or sold or used by complainants [64] either or any of their predecessors in interest since the day of the grant, issuance and delivery of said letters patent, there has been plainly marked thereon the word "Patented" together with the day and date of the grant and issuance of said letters patent, to wit,—July 28th, 1903; that defendant prior to the filing of the bill of complaint herein had full, complete and personal knowledge of, and had been notified in writing of, complainants' rights under said letters patent and of the grant, issuance and delivery thereof, and prior to the commencement of the wrongful and infringing acts had full knowledge and notice of the grant, issuance and delivery of said letters patent to complainants, and of complainants' rights thereunder.

3. That defendant has infringed upon said letters patent, and particularly upon claims 1, 2, 6, 7 and 8 thereof, which are as follows:

1. An underreamer comprising a hollow mandrel furnished with an internal shoulder, a

downward extension having opposite parallel bearing-faces having a keyway therein, shoulders at the sides of such extension, and upwardly and inwardly sloping dovetail slipways beneath said shoulders; a spring on the shoulder in the hollow mandrel; a rod playing in the mandrel furnished with a key-seat and supported by the spring; dovetail tilt-slips playing in the slipways and furnished with key-seats respectively; a key in the key-seats of the slips and rod and playing in the keyway of said extension to hold the slips against the shoulders; said slips being furnished with inward projections to slide upon the downward extension of the mandrel to spread apart the cutting edges of the slips when the slips are drawn up.

2. An underreamer furnished with a mandrel having a downward extension provided with opposite parallel bearing-faces and a keyway in the extension; a spring supported rod furnished with a key-seat and playing up and down in the mandrel; tilt-slips slidingly connected with the mandrel and furnished with inward projections to slide upon the opposite bearing-faces of the downward extension to spread the slips apart at the lower ends when the slips are drawn up; and a key carried by the rod and carrying the slips. [65]

6. In an underreamer, a mandrel furnished with a hollow slotted extension, the lower end of which slopes upward at the edges; tilt-slips slidingly connected with the mandrel and fur-

nished on their inner faces with projections, the upper faces of which slope downward to slide upon the extension of the mandrel; and means connecting the slips with the rod.

7. In an underreamer, the combination with a hollow mandrel, provided with a slotted extension, a spring-actuated slip-operating rod provided with a pivot-key, tilt-slips provided with key-seats adapted to be engaged by said pivot-key, said key-seats being somewhat larger than the key to allow the slips to tilt, said slips provided with inwardly-projecting shoulders, and said slotted extension provided with surfaces adapted to tilt said slips and hold the same in expanded position.

8. In an underreamer the combination of a hollow mandrel with a hollow slotted extension, said extension having opposite parallel bearing-faces, a slip-carrying rod in said mandrel, slips connected to said rod, said slips having projections which bear against said extension, said slips being provided with key-seats, a key carried by said rod, each of the key lying in a key-seat of a slip, and the key-seat in each slip being somewhat larger than the key to allow the slips to partake of a tilting action.

by the manufacture and sale of the so-called "Wilson" and "Wilson Improved" underreamers like complainants' exhibit, "Wilson Reamer" and "complainants' exhibit, Wilson Reamer No. 2" and the Wilson reamer with the two-piece key-construction; and that each of the said Wilson reamers

embodies and contains the invention patented in and by said letters patent and particularly embraced within each of said claims 1, 2, 6, 7 and 8 thereof; that each of the said Wilson reamers is an infringement upon each of said claims 1, 2, 6, 7 and 8 of said letters patent; that each and all of said Wilson reamers were manufactured and sold by defendant without the license or consent and against the will of complainants, or any of them, or any of their predecessors in interest, and in infringement and violation of said letters patent and of the exclusive rights thereby granted and secured to complainants.

[66]

4. That defendant, its officers, attorneys, directors, agents, servants, workmen and associates, and each and every of them be perpetually enjoined from manufacturing or causing to be manufactured, using or causing to be used, selling or causing to be sold, either directly or indirectly, any underreamer or underreamers like or embodying the construction or interrelation of parts of either "Complainants' Exhibit Wilson Reamer," "Complainants' Exhibit Wilson Reamer No. 2," or the Wilson underreamer with the two-piece key device, or the underreamer set forth or described in letters patent No. 827,595, dated July 31, 1906 to Elihu C. Wilson, and from manufacturing or causing to be manufactured, selling or causing to be sold, using or causing to be used, either directly or indirectly, any part or parts thereof capable of being combined or used as a part of any underreamer or device in infringement of said letters patent, that is of claims 1, 2, 6, 7 and 8 thereof

in any manner whatsoever, or from manufacturing or causing to be manufactured, using or causing to be used, selling or causing to be sold, either directly or indirectly, any combination of parts capable of being assembled together or used in infringement of said letters patent that is of claims 1, 2, 6, 7 and 8 thereof.

5. That complainants recover of the defendant the profits, gains and advantages which said defendant has derived, received or made by reason of said infringement; and that complainants recover of the said defendant any and all damages which complainants or either of them have sustained or shall sustain by reason of said infringement of defendant.

[67]

6. And it is hereby referred to Lynn Helm, Esq., as Special Master of this Court, who is appointed, *pro hac vice*, to take and state the account of said gains, profits and advantages, and to assess such damages, and to report thereon with all convenient speed, and the said Wilson & Willard Manufacturing Company, defendant, its officers, directors, attorneys, agents, servants, employees, workmen and associates, and each of them, are hereby directed and required to attend before said Special Master from time to time as he may require, and to produce before him such books, papers, vouchers, documents, records or other things, and to submit to such oral examination as to Special Master may require.

7. That complainants do have and recover judgment against defendant Wilson & Willard Manufacturing Company for the sum of \$2,587.49, com-

plainants' cost and disbursements herein, and that the further questions of increase of damages be reserved until the coming in of the Master's report.

Dated June 27th, 1916.

EDWARD E. CUSHMAN,

District Judge.

Decree entered and recorded July 1, 1916.

WM. M. VAN DYKE,

Clerk.

By Leslie S. Colyer,

Deputy Clerk.

[Endorsed]: Cir. Ct. No. 1540. United States District Court, Southern District of California, Southern Division. Union Tool Co. et al., Complainants, vs. Wilson & Willard Manufacturing Company, Defendant. In Equity. Interlocutory Decree. Filed Jul. 1, 1916. Wm. M. Van Dyke, Clerk. By Leslie S. Colyer, Deputy Clerk. Frederick S. Lyon, 504-7 Merchants Trust Building, Los Angeles, Cal., Solicitor for Complainants. 3 Eq. Jl. 390. [68]

*In the United States Circuit Court, in and for the
Ninth Circuit, Southern District of California,
Southern Division.*

IN EQUITY—No. 1540.

UNION TOOL COMPANY, ROSA EICHEN-
HOFER, as Administratrix of the Estate of
FRIEDRICH EICHENHOFER, Deceased,
GEORGE L. CHADDERDON, and ED-
WARD DOUBLE,

Complainants,

vs.

WILSON & WILLARD MANUFACTURING
COMPANY,

Defendant.

Notice as to Taking Testimony.

To Wilson & Willard Manufacturing Company, De-
fendant, and Hunsaker & Britt, and F. A. Ste-
phenson, its Solicitors.

Please take notice that complainants in the above-
entitled suit desire all of the evidence to be educed
in the above-entitled cause to be taken orally.

Respectfully,

FREDERICK S. LYON,

Solicitor for Complainant.

Received a copy of the foregoing notice this 22d
day of September, 1910.

F. A. STEPHENSON and
HUNSAKER & BRITT,
Solicitors for Defendant. [69]

[Endorsed]: No. 1540. U. S. Circuit Court, Southern District of California, Southern Division. Union Tool Co. et al. vs. Wilson & Willard Mfg. Co. Notice That Complainants Desire Testimony to be Taken Orally. Filed Sep. 26, 1910. Wm. M. Van Dyke, Clerk. Chas. N. Williams, Deputy. [70]

In the United States District Court, Southern District of California, Southern Division.

IN EQUITY—CIRCUIT COURT No. 1540.

UNION TOOL COMPANY et al.,

Complainants,

vs.

WILSON & WILLARD MANUFACTURING
COMPANY,

Defendant.

Testimony.

Proofs for final hearing, taken pursuant to the sixty-seventh equity rule, before Leo Longley, Special Examiner, by stipulation, commencing at 3 o'clock P. M., Friday, November 1st, 1912, at 504 Merchants Trust Company Building, Los Angeles, California.

Present: Frederick S. Lyon, on behalf of complainants; F. A. Stephenson and T. W. Waldon and Raymond I. Blakeslee, on behalf of defendant.

Whereupon the following proceedings were had:

It is stipulated and agreed that uncertified printed copies of United States letters patent furnished by the United States Patent Office may be offered in evidence with the same force and effect as originals

76 *Wilson & Willard Manufacturing Company*

or duly certified copies, subject to such objections as to competency under the pleadings, relevancy and materiality as shall be offered and subject to the right to either party to offer certified copies thereof in case any error be found in any printed copy offered.

It is further stipulated and agreed that the depositions of the witnesses be taken stenographically, either by the Special Examiner or other competent stenographer appointed by him, and that a copy of the depositions of all witnesses on [71] behalf of both parties be furnished each side, and that the cost of such copy for each side shall be taxable as cost to the prevailing party. •

It is further stipulated and agreed that the reading over and signing of the depositions of the witnesses be, and the same are, hereby waived, and that the Special Examiner shall certify the same to the Court, with the same force and effect as though duly read over and signed by the witnesses; subject, however, to the right to either party to demand the reading over by any given witness of his deposition and the signing thereof, such demand to be made not later than the time of excusing such witness from the stand.

It is further stipulated and agreed that for the purposes of this suit the complainants are the owners of the full and exclusive right, title and interest in and to the Double patent referred to in the bill of complaint and no question as to title is in issue in this suit.

It is further stipulated and agreed that the de-

fendant received from the complainants, on about the date of such instrument, a notice in words and figures as follows: [72]

It is further stipulated and agreed that the Union Tool Company and the Wilson & Willard Manufacturing Company are corporations as alleged in the bill of complaint.

It is further stipulated and agreed that all exhibits offered in evidence during the taking of proofs in this case may be retained in the custody of counsel offering the same, to be filed with the clerk of this court when the case is called for final hearing, and to be produced at the subsequent taking of testimony or depositions on behalf of either party, upon notice, and each party shall have access to all such exhibits during business hours.

Mr. LYON.—The complaint offers in evidence copy of letters patent No. 734,833, dated July 28, 1903, to Edward Double, for underreamer, and the same is marked "Complainant's Exhibit Double Patent."

Whereupon the further taking of testimony herein was adjourned until Saturday, November 2, 1912, at 10 o'clock A. M., at the same place.

On Saturday, November 2, 1912, at 10 o'clock A. M., the further taking of testimony herein was resumed, pursuant to the adjournment. Present: Frederick S. Lyon, on behalf of the complainants; F. A. Stephenson and T. W. Waldon and Raymond I. Blakeslee, on behalf of the defendant.

Whereupon the following proceedings were had:

It is further stipulated and agreed that in case the

counsel called upon to cross-examine any witness for either party desires a transcript of the testimony in direct examination of the witness before cross-examining him, the witness be excused from the stand until such transcript be furnished, and that any delay thereby occasioned shall entitle the party to a reasonable extension of time for completing proofs.

[73]

It is stipulated that no question as to title is in issue in this suit, and that defendant prior to the commencement of this suit received notice from complainants of the grant of the Double patent in suit and of the charge that defendant was infringing by the manufacture of the Wilson underreamer.

Testimony of William E. Youle, for Complainants.

WILLIAM E. YOULE, called as a witness on behalf of complainants, testifies:

My name is William E. Youle; age 65; occupation, drilling oil wells; residence, Los Angeles since 1877. Prior to 1877 I resided in the Pennsylvania oil fields, was engaged in drilling oil wells there from 1863 to 1876; I have continued connected with drilling oil wells in California for about thirty-two years. The first California oil field I drilled in was Newhall. The next was Moody Gulch, Santa Clara County. Next, back to Newhall. Next, to Puente—opened up the Puente. Eleven years in the Kern County fields—opened up the first wells there. Then drilled north in Colusa County—two or three years there wild-cattling deep wells. Back to San [74] Luis Obispo County—deep wells there. Three years ago

(Testimony of William E. Youle.)

I graduated, after thirty-five or thirty-six years in the business.

By "wild-catting" I mean looking out territory first, with a view of ascertaining the probabilities, the ear-marks that you could see, and making up your mind whether you would be justified in trying for oil. Subsequently, after more investigation, you make up your mind to drill a well. In fact, the Newhall field, the Puente field and the Kern River field were all due to my first efforts.

I have had a whole lot of experience with underreamers. My first experience with underreamers—I have tried a good many—were not successful. The first tool that I ever saw and used was an underreamer with a cutter on one side with a spring attached to it to throw it up under the pipe. That was in about 1882. The next thing I saw was a bit, split in the middle, with a tapering wedge, that when it hit the bottom it would expand the bit the full size of the hole. It looked all right. The trouble we had with that was the stem that threw the wedge open, when it hit the bottom, would break the tool off and we could not get the tool out. The trouble with the one-sided arrangement was it would come down the wall here and strike a hard streak and it wouldn't hardly touch it but would glance back, and then come to a soft streak and it would cut a great hole in the side of it; and that would make a straight hole crooked—that is, the reamed part of it would be crooked, due to the fact that the one-sided arrangement would not cut out where you wanted. That

(Testimony of William E. Youle.)

was a failure. The bit was a failure in consequence of the liability of the stem that was to shove the wedge down after it came to the bottom—the stem would hit the shoe and push the wedge down, and break, and we could not get the tool out. And sometimes that would get balled up with mud. All drillers know what that means. It gets so you can hardly cut it off with a chisel. It would hold the stem [75] rigid and in trying to get it through you would break it off, maybe. We had that trouble. Well, that didn't work, and the one sided reamer didn't work. Now, I think, the next one, I got a Leidecker in West Virginia. There was one of those shipped out here—I think I used the first one—by McFee, the McFee Supply Company, and he wanted me to use it or try it. Well, it seemed to start off pretty well; but we got into hard rock and we could not get the pipe to follow. The trouble with that reamer was the clearance was too large, and it had the same proposition of a wave in reaming that the others had. Well, I got pretty near disgusted with underreamers. But I bought another one. A man by the name of Mentry invented one. It had two legs, with a knuckle at the bottom, and spring attached to the knuckle so as to throw it up until it reached under the pipe and then the spring released it and expanded it. And I bought that just complimentary to Mr. Mentry. I didn't use it; but I loaned it to a fellow at \$5.00 a day, and he fished for it for three months and he never got it out of that hole. That was a reamer that I never used.

(Testimony of William E. Youle.)

By “fishing” I mean: He put it down without a heavy sinker run it light—and it was like a hollow-reamer. It was the worst thing that was ever put in a hole. And he got down into that hole with it unexpanded, into a place that caved out big enough for the reamer to expand, and I am a son of a gun if you could get it back, because it would not hit the pipe, you know. It went down unexpanded too low; got into a place that it shelved off, and big enough to expand, and dammed if he could it out. He could not ream out above it, and there he was. He finally jarred off the neck of it and left it in the hole, and he fished for it about three months. When I say “fished” I refer to a tool being lost in a hole. The reason I forgot to state about that one, I never used that. But that was a reamer that I did have. Well, then I think the next one that I used—I didn’t [76] use that myself, but I had a crew use it for a little while. This reamer was an Austrian under-reamer. Well, the boys used that, but we could not get the pipe to follow it. Now, you see in that Sunset field it was alternate in the change to hard shelves down the hole; and the Puente field the same way; and the way we got down as deep as we did was by being very careful, first, not to pour any water in the hole to soften it, and second, by having everything ready so that there was no delay to allow the rock to rot and cave in, and chase that hole down as fast as we could and put in a string of pipe to protect it—though maybe if we were lucky we might get a hole 1500 feet in that kind of formation, but we

(Testimony of William E. Youle.)

would have to be lucky to do it, because we didn't underream and couldn't underream with anything we had had up to that time, up to the time I speak of the Sunset and Puente field. Later, about 1902, maybe, or 1901—I forget the date—I got a letter from Mr. Double regarding an underreamer, and I had heard of it before through Mr. Kellerman. I was ready to try anything that would get a hole down, and I tried it, and used the underreamer myself. In one instance we had 400 feet of very hard rock, and we were drilling an experimental well. Below that 400 feet of hard rock we struck a very bad soft, cavy formation that we could not drill any more in that hole without pipe. That was the first hole that I used the Double underreamer in, and I used it myself. I had men there sharpening the cutters and pretty near kept them busy. It was very hard and you could not get more than half a screw at most. That would be approximately two feet and a half, without sharpening the bits. Now, we put a stem right on top of that underreamer and went through it just the same as drilling. But I kind of led up to that; I didn't do it at once. But I saw it was doing the work and I knew if I could hit it hard enough I could ream it. I never lost a cutter, I never had an accident, while reaming that 400 feet. Subsequently [77] I got the pipe in below that 400 feet down into this soft streak successfully; got down into a bad place in the bottom, and in drawing the pipe left a joint in there. We could not get at the pipe after pulling the other pipe, because it caved

(Testimony of William E. Youle.)

on top of it. We put on a new shoe and went down to the cave of this pipe, and the bit would not hit it; it was just one side. I says to the boys, "Put that underreamer on with three jars and crack it to it," and dammed if we didn't cut through that pipe in there and drill it up with that underreamer. I finished this particular well to 3,000 feet deep, was using eight-inch casing when I started the use of this Double underreamer, and carried the eight-inch casing 2,400 feet down.

As a matter of fact, if we didn't have an underreamer we could not have done the work. I had never seen any before. We would have had to stop the eight-inch at the depth of this hard streak and put in six-inch. Then the six-inch inside of the eight-inch would make a difference of two inches and the difference of one string of pipe. It would have been disadvantageous to have thus decreased the size of the casing because of the fact that in our past experience when we did that we were making the hole smaller and reducing the liability of getting it deep enough. Well, there was a good deal of territory condemned here because of the fact that they had gone to the end of their string, as they called it. 1200 feet was very deep before the underreamer, and they condemned territory with millions of dollars in it because they could not go down.

The use of a successful underreamer simply made California worth millions of dollars, for the reason that all deep territory is the prolific territory. It enables you to reach the deep territory.

(Testimony of William E. Youle.)

After my experience with this well I subsequently used other Double reamers to the entire extent of underreaming whenever [78] necessary.

The Mr. Double that I have referred to is Edward Double, the President of the Union Tool Company of Los Angeles.

Since 1902 I have been about the fields of California all the time up to three years ago, and since three years ago have made long trips into the fields; made trips east into the fields. I have always done that. I never go east without going into the oil fields.

The first time I saw the Wilson Reamer I thought it was a Double reamer. I did not take it apart or anything. I had not heard of a Wilson reamer at that time. I thought it was a Double reamer because the cutters resemble the Double, the body of the reamer and the cutters. Prior to the Wilson reamer there was nothing really in use by practical men except the Double. Mr. Edward North, of Los Angeles, made a kind of a reamer, a kind of a hay press I called it. It really could not do the work you know. I tried it; did not have any success with it at all. And the way that happened, I bought an outfit—engine, boiler, rig, tools and all—and the North reamer was with them. And we had a little shell under the pipe up in Ventura, and I said, “Boys, that may scrape that off”; and we could not do it, we had to get another reamer. The thing would not latch; it came out through on top when the jaw is spread out and we could not make it work.

(Testimony of William E. Youle.)

The North reamer I speak of is that shown in patent No. 674,793, to Edward North.

My son tells me they are using Double reamers in India. I don't know anything about how many they have got there, or anything about it.

Q. 48. I will ask you to compare, as to the mode of operation and the inter-relation of the parts, the Double underreamer, to which you have referred, with the Wilson underreamer. [79]

A. Well, I don't see much difference except the incline that it slides on. The effect is the same. That is the Wilson, ain't it? (Witness picks up a bit of the Wilson reamer.) Well, I can't exactly diagnose now just how those are; but what I see is the slide; the incline is different on the Wilson from the other one. That is all. But it is in the same position in the end.

Q. 49. Is the mode of operation different?

A. No. It may be technically different, but to me it don't seem to me it would make any difference to plane out, that is, to slide up a plane, which way you expanded it, whether you did it on the side or in the center. Make the same motion whether it runs up the side. That is about all the difference I see.

Q. 50. You never personally used a Wilson reamer, did you?

A. No. I had a Wilson reamer over there at Sunset—at least had knowledge of it. I was up to the Monarch Oil Company one day, and I said then—it was latched up, you know; I said, "To look at it you would think it was a Double," but I didn't take it

(Testimony of William E. Youle.)

apart and look at it, nor they didn't. But it would be difficult matter, to look at that, to tell exactly the difference. I would not like to go into that. I can't see any difference. That is, the working of it is similar.

Cross-examination.

(By Mr. BLAKESLEE.)

Q. 51. Where was the first underreamer that you saw in use? A. The first underreamer?

Q. 52. Yes. A. In my life?

Q. 53. Yes.

A. The first underreamer that I ever saw was one I used myself along in 1880. [80]

Q. 54. "Where" was the question?

A. It was in Santa Clara County near Parisimo.

Q. 55. What type of reamer was that?

A. The latch on the side.

Q. 56. Do you remember the name of it?

A. I don't, no. I think it was made by—I know it was—by Charlie Oester of the American Tool Works of San Francisco. Pretty good to member that, too; but I do.

Q. 57. Did it not actually underream so as to permit the lowering of the casing?

A. You mean to permit the casing to go down the hole?

Q. 58. Yes. A. Oh, no.

Q. 59. What did they use it for?

A. Why, it is like drilling a well in theory—it looked all right on paper, but it didn't work so well. You see, the bearing was all one side, throwing the

(Testimony of William E. Youle.)

back of the underreamer clear to the wall on the other side.

Q. 60. I understand your statement as to that; but did it not actually operate to underream, and was it not so used?

A. Well, the idea is this. I think you will appreciate that, too. You dig a hole that is straight. It has got to be straight to let the pipe in. You may enlarge that hole four inches and still not get your pipe further than before. Why? Because you enlarge it in a circle out here and the pipe cannot go down through.

Q. 61. Well, did they stop using it, as soon as they started, for that reason?

A. Well, I stopped it.

Q. 62. Did you know of its being used elsewhere?

A. No. I know it was tried elsewhere but they didn't use it very long. I know several that bought them. [81]

Q. 63. What I am getting at is, was it not used successfully in the respect that it permitted the casing to go down?

A. Never, to my knowledge.

Q. 64. As to the next underreamer you have testified to—where was that used?

A. Sunset, about 1892, or '3.

Q. 65. Was that used more or less extensively?

A. No.

Q. 66. Did it not actually underream?

A. No; not actually.

Q. 67. And what was the name of that?

(Testimony of William E. Youle.)

A. The casing would not follow.

Q. 68. No; the name of that underreamer.

A. The Swan, made by Leidecker.

Q. 69. You have encountered that Swan underreamer in other fields in California?

A. Oh, I have seen them laying around. Not very many. I think I have seen—I don't remember of ever seeing more than two I used to buy second-hand rigs, and in doing that, you know, taking an inventory of the material, I would run across different kinds of tools that had been used, or tried and thrown away.

Q. 70. There is a Swan underreamer in use at the present time, is there not, and also a Leidecker?

A. No; I don't know that there is. I don't know of any first-class driller or contractor that is not using the Double underreamer. I don't know of any—or the Double principle. Now, if I saw that reamer hung on a stem swinging over the hole, I would be inclined to think they were using the Double. (The witness points to the Wilson reamer in front of him.)

I don't know of any first-class driller or contractor that is not using the Double underreamer. I don't know of any—or the [82] Double principle. Now, if I saw that reamer hung on a stem swing over the hole, I would be inclined to think they were using the Double. (The witness points to the Wilson reamer in front of him.)

Q. 71. Then am I to understand that you have never particularly studied the differences between

(Testimony of William E. Youle.)

the Wilson and the Double and between the Double and other underreamers, as to their specific construction?

A. Yes, I have. That is, the difference is this, that [83] it is so near the same that I could not tell the difference. The way it appeared to me, the way of working, and the cutters, and all, seemed to be on the same principle. I thought I saw a little difference the way it slid up an incline on the side. (The witness refers in his last answer to the Wilson underreamer in front of him.)

Used to drill wells at a flat price and naturally had to investigate the tools used very carefully. Very little change in Double reamers. Did not find any use or need for underreamers in Ohio, Canada and Pennsylvania. Nor did they need them in Indiana. They do need them in West Virginia however. Can't tell how long I have heard of Wilson Reamer but have heard drillers say they liked them. Technically there may be some difference between the Wilson and the Double Underreamer but naturally I can't see any difference whether they expand from the side or from the middle or where. The principle is the same. It is for the mechanic to describe the difference. What difference does it make to me how a man takes me up a hill, whether it is one side of the hill or the other, as long as he gets me on top and does it automatically and does it systematically. The construction is the same all through. It is not the outside appearance. The outside appearance might be deceiv-

(Testimony of William E. Youle.)

ing. But as nearly as I can figure it out, it is the same thing. What difference does it make whether I expand that in here or out here? (The witness in the last answer points to the Wilson reamer and first points to the opening between the two side walls or ends of the lower extremity of the reamer and then to the walls themselves.) The spreading feature, in my estimation, is the same. It spreads on the uplift at the end. They latch together the same. Have been more interested in the results obtained than in the actual construction.

Q. 89. I suppose you appreciate the difference which exists between these reamers—[84]

A. Well, I would like to know myself. What difference is claimed?

Q. 90. With respect to the arrangement of the spreading feature.

A. The spreading feature, in my estimation, is the same. It spreads on the uplift at the end. They latch together the same.

Q. 91. Do you find any one part in the Wilson reamer for spreading the cutters?

A. Oh, I would have to take that reamer and hang it up. Those are things I don't care to go into.

Q. 92. It speaks for itself? A. Yes.

Q. 93. Then you have been more interested, I take it, in the work which the reamer would do than in the particular manner in which it did it or the construction whereby it did it? Is that not so?

A. I have been more interested in the results obtained by its use; yes.

(Testimony of William E. Youle.)

Q. 94. In your use of the Double reamer, have you ever had any of the cutters break?

A. Oh, yes; I have had the cutters too hard and had them shell off on the corners here. (Witness points to the bottom portion of the slip or cutter.) They would be tempered too hard and break here. (Pointing to the end of the cutter.)

Q. 95. Did you ever have any of them break above the cutting portion of the slip? A. No.

Q. 96. The Double reamer which you used had a top portion jointed to the body or mandrel, which is before us here, did it not?

A. You mean joint here?

Q. 97. Yes. [85] A. Yes.

Q. 98. In use did you ever have these joints fall or break?

A. Never. No; I never had one break.

Q. 99. Have you heard of them breaking at that point?

A. Why, I don't know. I have seen them in the shop for repairs. Here is the proposition about this: If it breaks off there—take the top of the Wilson and that would break off here. You lose the pin off and then loose the string. The same thing will occur in the Double or any other tool that you run in the hole, if they are used by men who punish them.

Q. 100. Did you ever hear of a Wilson breaking at that point?

A. Oh, no; that would not cut any figure at all with me. If there was a bad driller on, they will break.

(Testimony of William E. Youle.)

Q. 101. Did you ever hear of one?

A. I don't know as I ever did; no. My experience is they will break anything.

Redirect Examination.

Q. 112. I understand the old reamer, then, that you used, had the shoulder that you refer to now square instead of inclined.

A. I think it was square. It was so near square, anyway that it looked square. Then there was another thing I called Mr. Double's attention to and he remedied. This side here (referring to the side of the bit) was first made too small, outside, in diameter, and if the shoe got worn a little this would enter the shoe before the shoe would hit that and knock it down; the shoe would get away down here, so it was bothersome; and Mr. Double increased the size from here to here and we have never had any trouble since.

Q. 113. When was that increase made?

A. Oh, that was five or six years ago. More than that, I guess.

Q. 114. That change is simply in the size and the proportion of the slip. [86]

A. That is all.

Q. 115. Do any of these changes effect the general mode of operation or the interrelation of the parts?

A. No.

In oil well drilling breaking of tools of all kinds is very frequent. Having good luck with the hole they pile the stuff on it to do it quick.

I spent eleven or twelve years in the Sunset field

(Testimony of William E. Youle.)

and drilled fifty-odd wells there. I commenced there without an underreamer. The deepest well I was able to put down in the Sunset field prior to the underreamer was approximately fifteen hundred feet—a little over—with all the modern type tools and appliances that we could buy. That is down on Section 13-11-23. Now, the reason of that was the Sunset field was particularly soft, with alternate hard shelves. I had driven pipe through some of those shelves—punished the pipe a little, but got through and gained a little that way.

After the underreamer came out, wells have been put down over 4,000 feet. There are fields in the Santa Maria that will average 3,600 feet, and they are able to reach that depth. It would be impossible to do it certainly without an underreamer, without any question. You might churn pipe up and down and keep it loose, but if you could not underream that hard rock you could not get the pipe through it.

Recross-examination.

The sub of the Double holds with as much security as the threaded pin at the end of the Wilson reamer.

In referring to the Double Improved will state that cutters were to go up in on an incline and be held in position and don't ply back and forth as the cutters did before with the old style of reamer. The changes to the cutters overcame difficulties which had always been bothersome with the old style Double reamer. [87] The sub or upper portion of the Double underreamer body is an essential part of the body. When Mr. Double first called my at-

(Testimony of William E. Youle.)

tention to the improvement to the Double underreamer, (referring to the Double improved) he said, "We have made an improvement in that and there won't be any more trouble with that slipping." Then I said, "Did you ever have any complaint about getting the jaws stuck in the bottom of the pipe?" He says "Yes, we are going to remove that." Am intimately acquainted with Double having had lunch with him many times and liked him very much.

(Complainant's Exhibit Double Patent offered in Evidence.) [88]

Testimony of Thomas J. Griffin, for Complainant.

Testifies on behalf of complainant; states that his name is Thomas J. Griffin, fifty years of age, occupation, mechanical engineer, residence Los Angeles. Has been connected with drilling oil wells, first experience in 1876. First experience in Texas. Have drilled in Virginia, West Virginia, Texas, Old Mexico and California. Drilled in Corsicana, Texas in 1880. Went to Ohio in 1884. Was in the mill and well machinery business in Galveston, Texas. Went to Old Mexico in 1904. Drilling for S. Piersch & Son for three years. First experience in California was with the Western Union Oil Company at Orcutt. Have used Wilson and Double Underreamers. Stated that from seventy-five to eighty per cent of reamers used in California are Double reamers. Ten per cent are Wilson. Have used the Mack, the Swan and the Austrian underreamers.

(Testimony of Thomas J. Griffin.)

Q. 44. Will you please compare the mode of operation and interrelation of parts of the two reamers last referred to, Double and Wilson.

A. To begin with the Double underreamer, after the lugs have been put in place and the ring has been slipped over the lugs—

Q. 45. When you refer to “lugs,” you refer to the cutters or bits or slips at the end of the reamer which are the means of cutting the holes, do you?

A. Yes, sir—the reamer is run into the casing, and, as it passes down into the casing, the ring is slipped up by coming in contract with the top of the casing, slipping the ring up until it comes to the square of the tool where the wrench goes on. There the tools are stopped until the ring is removed, usually, and the expansive force of the lug is controlled by the friction [89] on the side of the casing until the tools go to the bottom of the hole, and, as the lugs pass out at the bottom of the shoe, the tension on the mandrel or spring forces the drilling lugs into position expanded. With the Wilson & Willard underreamer, the process is identically the same. To put the Wilson & Willard underreamer together with new lugs, it is necessary to withdraw the Tee-bolt, place over it the spring and guide, securing the nut down to the proper tension or desired tension on the spring, removing the spreading pin, placing the—

Q. 46. You say removing the spreading pin. Where is the spreading pin?

A. At the lower end of the mandrel, placing in

(Testimony of Thomas J. Griffin.)

the tee-bolt. Wait a moment. I want to refer to another part that I should have referred to before referring to the assembling of the spring on the rod. This part is a block or retaining portion which should go on. It should go on the tee-bolt first and the spring placed on top of that with the washer and nut, then the tee-bolt with spring and retainer is inserted into the mandrel and the drilling lugs are placed on the tee-bolt and shoved in the slotted receptacles until a retaining bolt at the lower end of the mandrel can be screwed in, and then the retaining block bolt that is located just above the slotted portion of the mandrel is screwed into position, and then the reamer is ready for the lugs to be pulled down, collapsed, and placed into the top of the casing.

Q. 47. Do you use a similar ring to which you have just referred in the Double?

A. We use a similar ring in the Double before putting the tool in the casing.

Q. 48. And the ring operates in the same manner?

A. The ring operating in the same method as the Double. To assemble a Double Reamer, it is necessary to have the top or sub [90] taken off; then placing the spring and spring-mandrel in at the top of the reamer, shoving it down through, placing the reamer lugs into position, using the retaining key at this point to insert into the lugs through the rod or mandrel. I wish to correct myself. Through one side or one lug, then through the mandrel and the other lug, and placing the

(Testimony of Thomas J. Griffin.)

retaining keys in the outside of the retaining key to prevent it from coming out. The lugs then are pulled down to their lower extremities from below the shoulders, collapsing the lugs, being held in position by the usual ring, and the tool is ready to go into the hole after placing the sub or screwing the sub on top of the hollow mandrel. Now, with the Wilson reamer, the lugs brought down and the ring placed thereon, the tools are ready to enter into the hole. As the tools go down the casing, the lugs are retained in position, collapsed, by the friction of the casing until the lugs pass out through the shoe at the lower end of the well casing, and as soon as they do they are expanded into their full size, their largest size, so that the tools can proceed to drill or ream the hole the desired size. After the hole has been reamed to a sufficient depth or the tools are desired to be withdrawn as the tools start out of the hole, coming to the bottom of the shoe, which is on the lower end of the casing, the lugs by friction are pulled down until they pass clear of the retaining pin in the Wilson reamer and by friction are held there until the tools get to the top of the casing; and the time the tools are leaving the top of the casing, the usual ring is slipped over and comes in contact with the lugs and the lower part of the mandrel and holds them in position while the tools are withdrawn from the top of the casing and swung out of the way. In the Double reamer, the action is identically the same, the lugs being held in position until they got out of the casing, and they

(Testimony of Thomas J. Griffin.)

are there held in position by the usual ring and swung out of the way. [91]

(Resumed.) When the tools and reamer are desired for the purpose of enlarging a hole that has been drilled prior by the ordinary bit to any desired depth below the shoe or in the casing, and the object of the underreamer and operation of the underreamer is for the enlarging of this hole to a sufficient size to allow the casing and couplings to go through, the rock or hard portion is reamed out by first placing the rim and contracting the points of the underreamer; you lower the underreamer into the hole, and it gets below the shoe or casing and the expansion at once takes place, caused by the tension on the tee-rod or mandrel, expanding, thusly pulling up the cutters on an incline at the bottom or lower end of the mandrel, thusly forcing them out and pulling up against their shoulders. Then the drilling line and the beam is brought into use, hooked up in the usual method, and engine starting up underreaming proceeds by the upward and downward movement of the reamer until such depth has been attained desired, or the underreamer bits or lugs have become dull, or it is necessary to run the bailer, clean out. Then the reamer is withdrawn from the hole for such purpose.

When the underreamer is being reciprocated in the well-hole to enlarge the hole, the underreamer and string of tools is turned by the action of the drilling line, and drilling line being laid in similar to rope and the working upward and down of the

(Testimony of Thomas J. Griffin.)

string of tools keeps the tools constantly swinging and turning in first one direction and then the other, thereby eliminating any possible danger of the underreamer drilling a key-way through hard substance. In early days they used a wrench or some other means to continually turn the drilling line, suspended with the tools at the lower end, backwards and forwards to cause this changing of position, but we found by actual practice that that was unnecessary. [92]

The interrelation of the parts of the Wilson exhibit underreamer and the Double exhibit underreamer are identically the same. The operation from the driller's standpoint are the same. The operation in drilling is the same. The actuation of the mandrel or tee-rod is the same; the slotted extension of the two reamers are the same; the construction of the lugs is the same, or their mechanical action is equivalent. There is a slight difference in the sizes of the slotted extensions and angles. Otherwise they are identically the same tool. The means for holding the cutters or bits from being pulled out sideways, namely, dovetails, are the same in the Double reamer as in the Wilson. The Wilson reamer has the same dovetailed arrangement and slotted extension. The cutters are mounted the same except that Wilson has a slotted tee-rod and Double uses the key sliding through a key-way at the lower end of the spring actuated mandrel. The tilting action of the cutters is identical. In both the Double reamer and the Wilson reamer the slots in the bits in which the head of

(Testimony of Thomas J. Griffin.)

the spring-actuated rod operates are larger than the head of the rod. The integral portion of the slotted extension of the Double reamer being a metallic portion at the center is for the purpose of giving the reamer additional strength. It does not have any effect in the expansion of the bit. Have seen a great many Double reamers in use. Double reamers are made with different widths of cutters depending on the style of reamer. The purpose of the different width of wide cutters is to increase the cutting surface circularly and to give it additional driving strength on its shoulder. To decrease the width of the cutter makes the drilling slower. The wider cutter is the more desirable. The difference in construction is merely a workshop selection. The old Double reamer used the narrow cutters. The old Double reamers had shoulders at the sides of the shanks near the bottom. I have seen such reamers recently, having been through the [93] Union Tool Company's shop. These were new reamers of the large and small sizes both. It would make no difference in the mode of operation or the inter-relation of parts in the Double reamer if the center portion or the spreading surface at the bottom were cut away and the spreading were secured entirely by the sides of the shoulders. In this regard the mode of operation of the Double underreamers and the Wilson underreamer is a mechanical equivalent of the other. The first underreamer I used was in 1892 in the West Virginia fields. It was the Mack reamer. The old Mack reamer had a spring-actuated rod

(Testimony of Thomas J. Griffin.)

hinged or put together with a lug coming out of the side of the mandrel and wedging down between the cutters for the purpose of expansion. I tried to use it for about three months but abandoned it as casing would not follow. The patent to Mack No. 496,317, dated April 25, 1893, shows the reamer I refer to. Then tried the Austrian reamer with no success. The well was lost because the tools got stuck in the hole with the reamer on the bottom of the tools. The rope was parted and we failed to recover the tools. Underreaming was necessary in the West Virginia field at that time. The Mack and Austrian underreamers were the only ones we had. The next underreamer I used was in Corsicana, Texas, in the year of 1895. It was a Swan reamer and I also used the Austrian reamer there. Put down one well with the Swan reamer. Well was about 1,100 feet deep. Had only two small shells to ream which we did with the Swan. The Swan did not give satisfaction. We had a drive shoe at the bottom of the casing. We were using what was known as drive pipe and what we didn't get out with the old Swan and the Austrian we broke off and then drove the pipe through. Next use of underreamers was in Texas where I contracted to drill a 2,000 foot artesian water well. I used Mack, Swan and Austrian reamers. I was continually changing from one to the other, trying to get [94] the best results. I had absolutely no success with either of these reamers, as I had to pull the casing and start the hole over with a larger bit to enable me to get down to the proper depth. In 1900 I tried

(Testimony of Thomas J. Griffin.)

to use a Mack underreamer at Spindletop. I failed as I could not enlarge the hole. Lost two wells on account of losing the tools in the bottom of the well. Next use of underreamers was at the Isthmus of Tehuantepec where I used the Mack, the Austrian, the Swan and the Double.

Q. 108. How did you come to use all four of such reamers in drilling such wells?

A. We had the Mack and the Austrian and the Swan on the lease, and as several had tried prior to my going down there to operate the lease and they had made a failure of it, Mr. Bodes, the general manager of Pierson & Sons of the City of Mexico, asked me did I know of another underreamer; that they were having a great deal of trouble with the underreamers that they had; that their trouble seemed to be the underreamers and he wanted to know if I knew of another underreamer. I told him that I had not used the other underreamer, but I understood that it was a very fine underreamer and I had been told by some friends of mine from California that they had used the Double underreamer up in the Kern River field, and that they had reported to me that it was perfect. He asked me did I know whom to get the reamer from. I told him that I did not, but I presumed that the Oil Well Supply people of Beaumont, Texas, could secure them an underreamer. He said "All right; I will wire them or our agent in New York to secure the underreamer and ship it down by fast boat to Vera Cruz and get it to you as soon as possible." You go on down and take charge

(Testimony of Thomas J. Griffin.)

of the lease and do the best you can with the old underreamers." I did so. The first well that I went in with the old Austrian underreamer, after drilling several days I found that it was cutting what I thought to be a circular [95] thread or key-way in the rock, and I ordered the driller to pull out the reamer. He said he had had it out about two hours before and put on new or sharp lugs, and that he didn't think it was dull. I says, "Pull it out and let us see what we are doing." He started out with it and his lugs were off—they were turned up, rather—and formed a wedge, and he jarred about forty-eight hours trying to loosen them up, and finally whipped off the line from the rope socket and left the tools in the hole. After fishing several days I got hold of them and tried to get the tools out and lost another string of tools in there and eventually had to cut the casing and shoot it off above the tools and side-track them. But I didn't do that on that well until after I got the Double reamer.

Q. 109. Explain what you mean by sidetracking in the last answer.

A. We term sidetracking in drilling where we have a crooked hole or have lost tools in the hole and have to drill through and start above the obstruction by filling in the hole with rock or old iron or brickbats or something of the kind and either inserting a shoe or wedge and starting in to drill at the side of the casing and making a new hole from that point down.

Q. 110. Go ahead and finish your testimony in regard to your experience on the Isthmus of Tehaun-

(Testimony of Thomas J. Griffin.)

tepec with the underreamers referred to.

A. During my wait for the Double reamer that did come by way of New York,—as the boats were only sailing from New York to Vera Cruz,—I put in the Swan underreamer in another well and lost the lugs. I put on another set and went down and tried to drill them out of the way. The lugs turned over on me, pulling up through the shoe of No. 11 well, and I jarred for about forty-eight hours on that and finally lost that string of tools. I fished for them and got hold of them but never was able to get [96] them out of the well. The result was that I had another sidetracking job on No. 11. After the arrival of the Double underreamer—we had practically suspended operations except on two other strings of tools that we were running where we had not got down to the shell formation—we waited for the Double reamer. I went into the original one where I had first lost the tools and drilled through and went in with another string of casing and went on down. As I drilled through the side of the casing, I had to enlarge that and I ran the Double underreamer in and drilled off the old iron and sidetracked the string of tools successfully.

Q. 111. How deep did you complete that one?

A. 2,100 feet, when we drilled into salt water and abandoned the hole.

The next underreamer used was at Torreon, Mexico. We used the Double reamer and finished the contract with it successfully. My next experience was in Los Angeles on the Niles Lease in the Salt

(Testimony of Thomas J. Griffin.)

Lake oil field. Used Double and Wilson reamers there. We borrowed a Double reamer from the Salt Lake oil people. They had been using Wilson reamers exclusively. The introduction of a successful reamer was the greatest blessing that was ever bestowed on a driller or oil company. Prior to the introduction of the successful underreamer it was a long, tedious and expensive operation to get a hole in a great many of the oilfields over 1,500 feet deep. The Double reamer was the first successful reamer. I do not consider the Swan, Mack or Austrian underreamers successful. I never saw one of them that I considered successful or even safe to go into a hole, and at the present time I would not attempt to put one of them in a hole.

When the underreamer was working in hard rock or drilling in iron, such as we often have to do in drilling up a joint or two of pipe, my experience with the Wilson underreamer was that the iron or hard rock would lodge in between the expanded lugs, wedging the lugs out expanded, and breaking the lugs off by the [97] lateral driving strain, in two instances. In three other instances, under my direct supervision, drilling in casing, I would find that the pieces of the casing would enter between the mandrel and the spreading pin, striking on the under side of the spreading pin and bending or breaking the spreading pin in some instances, and in others driving the solid particles of rock up between the lugs wedging the lugs so that when the reamer was started out of the hole coming up to the bottom of the shoe,

(Testimony of Thomas J. Griffin.)

the lugs would not collapse, thereby sticking the reamer in the shoe and necessitating the bringing of jars and jarring the tools, pulling off and leaving in the hole the lugs and pulling the mandrel out leaving the tee-bolt spring and lugs in the bottom of the hole. The Swan reamer I refer to is like that shown in the drawings of the Swan patent No. 683,352, dated September 24, 1901. I have also had some little trouble with the Double reamer. My greatest trouble with Double reamers is to get the cutters tempered right. I do not consider the diminished portion of the Double underreamer cutter shank a weakness. It is necessary in the operation of the Double Underreamer Cutter. I do not find any such diminished portion of the Wilson underreamer cutter. I consider the Double underreamer cutters have all the strength required to give action. It would not be possible to use Wilson underreamer cutters shown by exhibit, in a Double underreamer body. It would be necessary to make changes in the parts in order to make the cutters of the Wilson underreamer interchangeable with the Double or *vice versa*. I find in the Wilson underreamer no mandrel part or extension or any other construction between the inner faces of the cutter. Still I think there is a slotted extension between the cutter.

Q. 141. Please point it out.

A. I think that the slotted extension of the Wilson underreamer is practically the same thing as the Double underreamer and, as far as the operation is concerned, from the mere fact that [98] the Wil-

(Testimony of Thomas J. Griffin.)

son reamer has a spreading pin at its lower end, which is put in for the purpose of giving the bits the spreading action and also to keep the bits from swinging from side to side. The Double underreamer is practically solid at the end, though it is obvious it could be slotted, as I have seen and used the Double underreamer with the slotted extension out in the same manner or practically the same manner as the Wilson underreamer before me.

Q. 142. When the slotted extension was out in this Double underreamer that you have just referred to, was there a pin put across between the cutters similar to the pin that you have called the spreading pin in the Wilson underreamer?

A. No; it was not necessary. When the pin is out of the Wilson underreamer the faces which spread the cutters apart are entirely separate or spaced apart. But in the Double underreamer the part which spreads the cutters is one continuous part. Inasmuch as the Wilson underreamer is an extended fork it is not necessary to have a slot. The Wilson underreamer has no detachable key such as used in the Double underreamer. The action of the tee-bolt of the Wilson underreamer, mechanically speaking, is a detriment, though it can be used in the Double reamer identically as in the Wilson. I have seen them so used. It would not be possible to insert the tee and tee-head in the lower end of the body or mandrel of the Double underreamer as is done with the Wilson underreamer, as shown in the exhibit. If my memory serves me right there is very little

(Testimony of Thomas J. Griffin.)

difference in the width of the body and the shanks of the first Double underreamer cutters I used. They had square shoulders similar to the Wilson underreamer cutters. While the tee of the Wilson underreamer with some changes could be used in the Double underreamer, as it is made and exhibited, it could not be inserted at the lower end of the Double reamer. To insert it in the [99] Double underreamer it would be necessary to take off the sub of the Double underreamer body. I will again say that the cutters of the Wilson underreamer when expanding come in contact with the expanding bolt. [100]

Q. 180. In the expansion of the cutters in the Double underreamer, parts of the cutters are always in contact with the slotted intermediate extension, are they not? A. Yes.

Q. 200. Would you please state whether or not it is possible to obtain the expanding action of the cutters in the Wilson underreamer with the retaining-bolt removed?

A. I don't think it would be possible to get the expansion from the Wilson underreamer if the retaining-bolt was removed, from the mere fact that as the tool went into the hole, the retaining-bolt being removed would allow the bit to go into the side of the casing and cut a hole in it, as there would be nothing there to keep it from swinging backwards and forwards and if one side happened to strike a little bit hard on an opening or between joints of pipe and there happened to be a little burr left, or something of the kind, that it would drag on heavier than the

(Testimony of Thomas J. Griffin.)

opposite side, I think that the Wilson cutter would go into the side of the casing. If it didn't, as soon as it passed the lower end of the casing, and the shoe, that if either one of the lugs were to be just the least past the center, that they wouldn't get an even expansion and thereby would rock themselves; and if the pin was left out of the Wilson reamer at the lower end, or retaining-pin, [101] that the Wilson reamer would be inoperative and be worthless.

Q. 201. You are willing to state, are you, that you have never known of the Wilson underreamer having been used without the retaining-bolt?

A. Why, I never saw one used, and I don't think it would be possible, as I think I can clearly demonstrate it by the insertion of the key-bolt and bits, that the reamer would be all to pieces, as it rocks itself about four inches. (Witness, in giving this answer, places the bits and key-bolt in the Wilson reamer in the position or relation referred to by him and rocks the bits in the manner indicated by him.) It would not be necessary to decrease the thickness of the metal in the walls of the Double underreamer or in the cutters thereof, in order to enlarge the bore or longitudinal chamber in the Double underreamer sufficiently to allow the spring carrying stem to be inserted with an integral key head thereon. The tee could be shortened enough to allow it to enter the Double underreamer as it now is and still have ample room to hold the lugs. You would simply elongate the hole at the bottom of the enlarged portion of the mandrel sufficient to allow the ends of the tee bolt to

(Testimony of Thomas J. Griffin.)

slip through. I should say the hole in the Double underreamer would have to be increased about an inch and a half.

Redirect Examination.

(By Mr. LYON.)

Q. 213. You have stated on cross-examination, Mr. Griffin, as I remember, that you could not take one of the bits of Complainants' Exhibit Wilson Reamer and utilize that particular bit in Complainants' Exhibit Double Reamer? A. As constructed.

Q. 214. Why not?

A. For the reason that Mr. Double has seen fit to put in a [102] metal in the bottom of his mandrel to strengthen and to obviate any possibility of a break—of the mandrel breaking; but the Wilson bit can be used in the Double reamer, as exhibited, by the elongation of the slot and the tapering, which is nothing more than mechanical, tapering the center of the mandrel down to allow the Wilson bit to contract and come together so that it would enter into the top of the casing, and leaving the lug on the side of the Double bit as it now is—or the Wilson bit, I should have said, as it now is—to protect the center, in a manner, from filling in with rock or parts of iron.

Q. 215. The same result could be secured, could it not be cutting [103] away a portion of the inner face of the Wilson bit so as to permit it to collapse over the center integral part of the lower portion of the Double mandrel? A. Yes, sir.

Q. 216. In other words, if I understand your tes-

(Testimony of Thomas J. Griffin.)

timony correctly, the question is simply one of size and proportions?

A. Size and proportion, only.

Q. 217. Now, with regard to the use of the Double bits in the Wilson reamer—is that only a question of size and proportion?

A. Size and proportion.

I have seen Double underreamer cutters which would work in Wilson underreamer bodies. The bit now shown me is a regular 4½" Double bit. It is of a longer type than the Complainant's Exhibit Double reamer. This particular Double bit will operate in the Wilson reamer. Changes have been made to this cutter from the usual Double reamer cutters. The key-carrying hole has been enlarged and the shank has been made smaller to conform to the slotted extension of the Wilson reamer and the metal has been cut away at the back of the shank of the cutter to give it the desired amount of opening or spread. Changes do not affect the mode of operation of the parts—merely changes the difference in sizes. This bit I refer to is marked Complainant's Exhibit Double Long Bit, same offered in evidence, The bearing surfaces of the Wilson underreamer body are parallel or substantially parallel. To extend or elongate the slot in the Double underreamer body to permit the use of a solid key-head would in my opinion be simply mechanical construction. It is obvious. I prefer the type of spring actuated rod and key used in the Double to that in the Wilson, for the reason that the Wilson underreamer head will

(Testimony of Thomas J. Griffin.)

crystallize and break off. While parts of the cutters or bits of the Double underreamer are always in contact with the end of the [104] slotted extension of the Double reamer, that is not the case in the Wilson reamer. The only time that the Wilson lugs are in contact is when they are contracted to their lowest point resting against their retaining pins, or when the cutter is expanded. I never had any difficulty with the Double sub unscrewing. It is the same kind of a joint which connects the Wilson underreamer to the tools. The same kind of a joint which is used on the rest of the tools. The liability of unscrewing the Wilson underreamer [105] is the same as the liability of unscrewing the sub of the Double reamer. I have never seen the Double underreamer cutter that did not have a recess on the inner face for the purpose of causing expansion of the cutters. I do not find such formation in the Wilson underreamer cutters. I have never seen such formation or such recess in the Wilson underreamer cutter, until the one just placed on exhibit a few minutes ago. And that recess is on the Double cutter. The Wilson cutters are always in contact with the inner faces of the prongs. The expansion of the Wilson underreamer cutters takes place by the cutters engaging the narrow side spaces or edges of the prongs, while with the Double underreamer this expansion takes place by engaging the cutters with the broader faces of the intermediate slotted extension. It is preferable with a mechanic who is constructing it how he would desire to make it. With the Wilson

(Testimony of Thomas J. Griffin.)

reamer there are two pairs of surfaces with which the cutters contact while with the Double there is simply one pair. You would have the same number of surfaces in the Double underreamer if you separated the Double central bar into two pieces. And again if the Wilson did not have the cut-away portion at the center of the body you would simply have two pair of spreading surfaces, one on each side. Between each pair of the spreading surfaces on the Wilson underreamer body there is an open space, with the exception of the pin.

Testimony of Edward Double, for Complainants.

EDWARD DOUBLE testified as follows:

My age is forty-one; my occupation, president of the Union Tool Company; residence, Los Angeles, California. Have been president of the Union Tool Company for about four years. Prior to that time I was connected with the Union Oil Tool Company. That was the predecessor of the Union Tool Company. I am the Edward Double mentioned in letters patent of the United States, patent [106] No. 734,833. Companies referred to have manufactured and sold Double underreamers. I produce a statement herewith showing the number of Double underreamers manufactured by the Union Oil Tool Company and its successor called the Union Tool Company. This statement I show herewith:

UNION TOOL COMPANY.
Statements of Double Underreamers
Manufactured and Sold
to Sept. 30, 1912.

[illegible]

(Testimony of Edward Double.)

These Double reamers have been sold pretty much all over the United States and in some foreign countries. They have been sold in India, Russia, Japan and Mexico. At the time I invented the underreamer described in letters patent to which I have directed attention, there was not what you would call a successful reamer on the market. The Austrian and the Swan are the only two I have any recollection of. I had personal knowledge of both of those types. The construction of those reamers was too light to stand the work that reamers were put to. This weakness was due both to the construction and design. It was not merely a question of weight of metal or size of parts. [107]

The shop I was then conducting in Santa Paula, California, was a small shop. The Union Oil Company with which I was connected at that time had very little capital in manufacture of oil well tools.

I think it would be impossible to complete a majority of the wells in California without an underreamer, with the cable tool system. This for the reason that so many shells are encountered which would require too many strings of casing.

I first commenced the manufacture of underreamers in the year of 1900 or 1901. Have been making Double underreamers ever since. In my opinion the Union Tool Company furnished eighty-five or ninety per cent of the underreamers used in California fields.

Prior to the time that the Wilson underreamer came onto the market there had been no other in-

(Testimony of Edward Double.)

fringements of my Double patent. I sold underreamers to all the oil well supply stores and most of the large operating companies, prior to the time the Wilson underreamer came on the market.

The mode of operation with the Double and the Wilson underreamers is practically the same, with the exception of a few mechanical changes in the shape of expansion of the cutters, length and size of cutters. The Double has a hollow mandrel with a slotted extension, tilting action slips, spreading surfaces on their inner faces, and the Wilson has all the same features.

All the Double underreamers manufactured and sold, not only by the Union Oil Tool Company but by its successor, the Union Tool Company, since July 28, 1903, have all been marked with the word "patented," together with the date of the grant of said patent, July 28, 1903. I was living in Santa Paula at the time I invented the Double underreamer. The Union Oil Company, a large customer of our concern at that time, was using Austrian underreamers exclusively for their work, and Mr. Lyman Stewart of that company suggested that there would be a fortune for someone [108] who could invent a successful underreamer. That was really the starting point of the underreamer. The first one was made in Santa Paula under my supervision. It was used in Ventura County. This first underreamer did not have any notches in the sides of the mandrel above the upper end of the slotted extension. The slips in expanding bore against the spreading part in the

(Testimony of Edward Double.)

center of the reamer. The inner faces of the cutters bore against the spreading bearing. In all the underreamers I have manufactured there has been a continuous shoulder across the inner face of the cutters for producing the expanding action. The dove-tailed notches in the mandrel of the reamer body I first used about ten years ago. The Swan and the Austrian underreamers were considerably used prior to the production of my reamer. They were used to quite an extent and prior to the time I produced the first Double underreamer. I have seen the Swan and Austrian underreamers in operation prior to the time I devised my reamer. I have seen casing put down in holes which were underreamed with them. California is the only field I have personal knowledge of although I have heard of them being used in Virginia and other fields.

To my knowledge the sale of Wilson underreamers has been quite extensive and I know they have been successful.

Testimony of Chas. P. Barnes, for Complainants.

CHAS. P. BARNES, being called on behalf of complainants, testifies as follows:

My name is Chas. P. Barnes, age, 57; vice-president and manager of the California National Supply Company. Our company does a [109] general oil well supply and tool business. We have stores in Bakersfield, Maricopa, Taft, Shale, McKittrick, Coalinga, Brea, Orcutt and Sisquoc. I have been in business in California for about twelve years. We sell Double and Wilson underreamers

(Testimony of Chas. P. Barnes.)

mostly. Sold Double underreamers very largely for the last ten years. During the last two years think we have sold about two hundred Double underreamers and six or eight Wilson underreamers. To a small extent we sold Austrian underreamers prior to the advent of the Wilson underreamer. We also sold Double underreamers before the advent of the Wilson reamer. We did not handle the Austrian reamer very extensively because it did not fill our requirements in California. When the Double first came out it supplanted the Austrian altogether. Since then we have never sold one Austrian to my knowledge. The Austrian reamers did ream after a fashion. They were a failure in California oil fields but I cannot speak as to other fields, having no personal knowledge. I have understood that they did underream under certain conditions.

The Wilson underreamer has operated satisfactorily. There are quite a few of them in use.

Testimony of S. T. Peet, for Complainants.

Mr. Peet testifies as follows: My name is S. T. Peet; age, 53. I live in Los Angeles, California, and am manager of the Oil Well Supply department of the Fairbanks-Morse Company. I have been the manager for Fairbanks-Morse Company. I have been the manager for Fairbanks-Morse for about twelve years. We handle oil well tools and practically everything in the way of tools for use in oil fields. During that time we have handled the Double underreamers. We have also bought and sold Wilson underreamers. Prior to the time the Wilson under-

(Testimony of S. T. Peet.)

reamer was on the market, the Austrian, Leidecker, North and several other underreamers were used more or less. After the Double underreamer came out we sold practically nothing else up to the time the Wilson reamer came out. The Double reamer was [110] more practical and efficient than anything else in use prior to that time. I, myself, have never operated underreamers. My knowledge is solely that of information received from the driller. The percentage of the Double underreamer is very large. I can't tell exactly. I believe at least 90 to 95%. We don't stock the Wilson Underreamer to any extent and we do the Double.

Prior to the advent of the Double underreamer we had frequent orders for the Austrian, but not for the Leidecker or North. The Austrian was the principal one sold. It was very unsatisfactory, and prior to the advent of the Double underreamer there was a demand for a reamer. We sold a few North reamers. They were not satisfactory.

Cross-examination.

(By Mr. BLAKESLEE.)

Q. 25. As far as you are informed, the use of the Wilson & Willard—or the Wilson, rather—underreamers, has been attended with success, has it not?

A. Why, I have heard of very few complaints.

Q. 26. You frequently had reorders, I suppose, for Leidecker and North and other underreamers from parties purchasing the same, prior to the advent of the Double underreamer?

A. Yes, we had, for other underreamers.

(Testimony of S. T. Peet.)

(Complainants offer in evidence the Reamer heretofore marked “Complainant’s Exhibit Double Reamer.”)

By Mr. BLAKESLEE.—Objection is made to the offer of this exhibit. If such offer be for the purpose of presenting to the Court a specimen of example of the underreamer disclosed in the Double patent in suit; and if such objection extends to every part and feature of this underreamer exhibit which is at variance with the construction shown in the drawings and description in the specification of said Double patent [111] in suit. This objection is based upon and supported by the depositions taken so far by complainants, and by each part of such deposition which speaks of differences in structure between such exhibit underreamer and the specific structure disclosed in said Double patent in suit.

It is stipulated and agreed that “Complainant’s Exhibit Wilson Reamer” was manufactured and sold by defendant, and that prior to the commencement of this suit the defendant has made one or more of such Wilson reamers. Complainant’s Wilson reamer offered in evidence.

Proof for Final Hearing on Behalf of Defendant.

Testimony of Arthur G. Willard, for Defendant.

ARTHUR G. WILLARD testifies as follows:

My name is Arthur G. Willard; age, forty-one years; resident of Los Angeles; occupation, manufacturer. I am vice-president of the Wilson and Willard Manufacturing Company. I have been familiar with the manufacture of underreamers since the

(Testimony of Arthur G. Willard.)

year 1898. I am familiar with the Double underreamer as disclosed by patent in suit.

Q. 7. Have you ever experimented in the direction of inventing or producing an underreamer for use in drilling oil-wells? A. I have.

Q. 8. When did such activity on your part commence?

A. Well, in the year of about 1898, and from that up to the present time.

Q. 9. What were the results, if any, of your first experiments in this line?

Mr. LYON.—Objected to as calling for the conclusion of the witness, and not a statement of fact.

A. Read that question, please. (Last question read by the Special Examiner.) In conjunction with Tom O'Donnell we invented the O'Donnell and Willard underreamer.

Mr. LYON.—We move to strike the answer from the record and exclude [112] it from consideration, on the grounds stated in the objection to the question, and on the ground that it is with reference to a defense not pleaded, as hereinbefore set forth on the record in our objection.

Q. 10. (By Mr. BLAKESLEE.) Please state the circumstances surrounding the production of this invention by yourself and Mr. O'Donnell.

Mr. LYON.—The same objections are noted as to the preceding question, and on the ground that it assumes a fact not appearing in the record.

A. About the year of 1898 I was employed as a machinist, in the capacity of machinist, at the Baker

(Testimony of Arthur G. Willard.)

Iron Works. At that time the firm was engaged in the manufacture of oil-well tools and machinery, and they were called upon to manufacture lugs or cutters for the Austrian underreamer. It occurred to me that a more substantial underreamer could be constructed, and after I had devised what I thought to be an improvement over the Austrian underreamer, not being familiar with the workings of an underreamer in an oil well, I went to a friend of mine, Tom O'Donnell, who was a practical oil-well operator. I showed him some rough sketches of my design. He immediately pointed out features which would be objectionable to the operator; so I made him a proposition that we would go in together or work together on an underreamer of this design. In doing so, I tried to design the underreamer so that it would be practical—so that it would be possible to manufacture the same from a machinist's standpoint. Mr. O'Donnell made suggestions from a driller's standpoint. After we had satisfied ourselves that the design was practical, we applied for letters patent jointly, which was issued to us on that date—whatever the date of the patent is.

Q. 11. (By Mr. BLAKESLEE.) Can you produce the patent you obtained, or a copy thereof?

A. I can. [113]

Mr. BLAKESLEE.—A copy of the patent referred to by witness is offered in evidence as "Defendant's Exhibit O'Donnell and Willard Patent," the same bearing date June 14, 1904, and numbered 762,435.

(Testimony of Arthur G. Willard.)

Mr. LYON.—Objected to, on the ground that it is apparent on the face of said patent that it was not patented, nor did it become a printed publication, until June 14, 1904, which is some eleven months subsequent to the date of the grant and issuance of the Double patent in suit, and said patent is not a part of the prior art, and said patent is incompetent, irrelevant and immaterial for that reason; and upon the further ground that said patent is pleaded in the answer of the defendant solely as a printed publication or patent and is inadmissible under the pleadings for any other purpose.

Mr. BLAKESLEE.—Attention of the court is called to the filing date of this patent, December 8th, 1899.

Mr. LYON.—The patent and exhibit are objected to as incompetent to prove the recital referred to; and objection is made thereto upon such ground, and upon the ground that it is not the proper method of proof.

Mr. BLAKESLEE.—A certified copy of the file wrapper and contents of the O'Donnell and Willard patent will be filed with the record on behalf of defendant as authenticated proof of the day of filing of said patent.

Mr. LYON.—Is such certified copy present?

Mr. BLAKESLEE.—No.

Mr. LYON.—It is not offered at the present time?

Mr. BLAKESLEE.—It is not offered now; no.

Mr. LYON.—Complainants give notice that they will insist upon the completion of defendant's proof

(Testimony of Arthur G. Willard.)

before complainants are required to complete their rebuttal.

Q. 12. (By Mr. BLAKESLEE.) Have you or Mr. O'Donnell, or both of you, ever constructed an underreamer embodying the construction [114] and interrelation of parts and features of Defendant's Exhibit O'Donnell and Willard patent?

Mr. LYON.—Objected to as leading and calling for the conclusion of the witness, and not a statement of facts; not the best evidence; no foundation laid for the introduction of secondary evidence.

A. We have had several manufactured.

The first one was made about six months after the application was filed. One 9-5/8" reamer was made by the Baker Iron Works of this city and was shipped on November 21, 1900, to the El Moro Oil Company in Whittier. I superintended the construction during the course of manufacture. This underreamer I can produce. I will introduce it before my deposition is completed.

I was present while this underreamer was being used in drilling the well at Newhall near the Newhall Tunnel. I saw the underreamer in operation at that time. This reamer was not used to my knowledge in any other place. Prior to the manufacture of that underreamer we had the Hughes Manufacturing Company make a full size wooden model. I cannot produce this model. The driller in charge at Newhall where the reamer was first used was Mr. Lehman. He was superintendent of the Banker's Oil Company in the Kern River Field up to a few

(Testimony of Arthur G. Willard.)

months ago. During my employ at the Baker Iron Works I worked on such reamers as the Austrian, Kellerman, Mack, Swan and O'Donnell and Willard underreamers. The Mack reamer to the best of my knowledge was the same as reamer shown by Kellerman Patent No. 679,384. To the best of my knowledge the Swan underreamer was the same as that shown by patent No. 683,352.

I am familiar with the tools manufactured by the Union Tool Company known as the Double underreamers. I have examined and repaired a number of them. [115]

Q. 45. (By Mr. BLAKESLEE.) You may refer to the patent, if you wish, Mr. Willard.

A. (Examines patent.) Well, at the time we were working on the O'Donnell & Willard underreamer, there were only two underreamers in use, to my knowledge, the first being the Austrian, which has hinged lugs on either side, with a taper-box on the lower end for connection to a drill bit. The operators experienced considerable trouble with these lugs snapping or breaking off, and the Austrian underreamer was only used where it was absolutely necessary to do so in order to lower the casing. The Kellerman underreamer was an end underreamer, with the lugs hinged in the bowl, with a movable wedge between. The Kellerman underreamer also had its objections; and in working on the Austrian and the Kellerman underreamer I was trying to devise some way to meet the objections in both of these reamers, and, as before testified, I went to

(Testimony of Arthur G. Willard.)

Tom O'Donnell and with his help we devised the O'Donnell & Willard underreamer. The leading features of the Willard & O'Donnell underreamer is the hollow-slotted extension which is used as a spreading-bar for the cutters; the cutters being separately mounted on a movable T-bar allow the cutters to be pulled down and around the stationary partition when the underreamer is being lowered through the casing for underreaming, as shown in figure 1; a separate socket or pocket being on each side of the stationary partition; a T-bar suspending the cutters, working within a slot in this stationary partition, surrounded by a coil spring, which is used to keep the cutters in place while the underreamer is being used for underreaming.

Q. 46. Please state the particular advantages in service of this construction.

Mr. LYON.—Same objections.

A. The cutters, being allowed to pull down, close in around the spreading-bar or stationary partition, allow the lower edge or cutting edge of the cutter to hide up or close in sufficiently to [116] that the cutting edge does not engage the casing when same is being lowered for underreaming. This is accomplished by the cutter being slidable, mounted on a T-bar and the T-bar being able to slide vertically in the stationary partition or spreading-bar. These features, to the best of my knowledge, have never been used in an underreamer prior to 1898.

The reamer in evidence known as the O'Donnell and Willard underreamer is just the same as origi-

(Testimony of Arthur G. Willard.)

nally made with the exception of an improvement put on this end, namely, the collar or cross bar at the upper end of the reamer. That collar is for the purpose of engaging the casing while the reamer is lowered through the casing, and to hold the cutters collapsed while lowering the reamer through the casing, and to allow the cutters to be perfectly free so that the lugs engage the casing instead of the cutters. This is the reamer I saw in operation in Newhall. I am not sure as to the date without looking it up. I obtained permission from Thos. O'Donnell to obtain this reamer for an exhibit in this case, he having it in his possession.

I have been connected with the Wilson and Willard Manufacturing Company ever since its organization. I am one of its incorporators. Mr. E. C. Wilson is also one of its officers. I am vice-president and treasurer.

To the best of my recollection the first suit against the Wilson and Willard Manufacturing Company by the Union Tool Company was four years ago last May or June (in 1908). This suit I understand was dismissed two years after that date and a new suit filed. I had knowledge of the first suit and knew when the second suit was brought. My first conversation with Mr. Wilson in regard to the suit was probably in August four years ago, as I remember. That was prior to the preparation of the original answer in the original suit. I took no part in the preparation of the matters to be submitted to the attorneys for the defense of such suit. At [117]

(Testimony of Arthur G. Willard.)

the time suit was brought I think I had some conversation with Mr. E. C. Wilson in regard to the O'Donnell and Willard patent for reamer. To my knowledge Mr. Wilson had knowledge some time prior to bringing the suit. Wilson was also an employee of the Baker Iron Works at the time I was there. He was bookkeeper at that time. I had conversations with Wilson about underreamers in 1899, 1900 or 1901. Mr. Wilson was familiar with the O'Donnell and Willard underreamer, he being price clerk. After the year 1905 I went to Bakersfield as superintendent for the Bakersfield Iron Works. I have never sold or transferred my O'Donnell & Willard patent. I remained at the Bakersfield Iron Works about a year and a half during which time we manufactured the Wilson underreamer. During the time I was with the Bakersfield Iron Works, I did not manufacture any underreamers like "Defendant's Exhibit O'Donnell and Willard Patent." I left the Bakersfield Iron Works in July, 1907. Since this time I have been with the Wilson and Willard Manufacturing Company. Since I have been with the Wilson & Willard Manufacturing Company we made one O'Donnell and Willard reamer. It was practically like the patent drawings. There were a few changes in the bowl there. We put in a couple of extra pockets so as to catch the end of the cutters when the reamer was being lowered in the casing so as to be able to enter the underreamer or lower the underreamer through the casing. I never heard of this reamer after we shipped it about four years

(Testimony of Arthur G. Willard.)

ago. I understand Mr. O'Donnell is a man of means and an oil operator. He was financing my efforts to produce a successful underreamer. Mr. O'Donnell has been interested in a large number of oil wells in California at various times since 1898 up to the present time.

I am a stockholder in the Wilson and Willard Manufacturing Company—within ten shares I own one-half of the capital stock. About the year 1902 or '03 I first noticed the Double underreamer. I was still connected with the Baker Iron Works. Some changes have [118] been made to the construction and design of that reamer. I have known of its sale continuously since that time.

The O'Donnell and Willard reamer made by the Wilson & Willard Mfg. Company in about the year 1908 had certain changes in the pocket within the bowl. That reamer had two pockets, one on each side of a stationary partition. The two pockets were milled into the body so they would be parallel with the outside of the body. These pockets were for the purpose of allowing the upper end of the cutters to extend into these pockets when the cutters collapsed.

Q. 142. And what was the occasion of it?

A. It was to enable the cutters to hang free when passing in or out of the drill-casing.

Q. 143. Then they did not hang free without this device?

A. The tension spring was always on the cutters without that device.

Q. 144. And this was found to be an objection to

(Testimony of Arthur G. Willard.)

the reamer in its use before such device was put thereon.

A. Not any more than the same objection would apply to the Kellerman or the Double reamer. The object in making this improvement was to prevent what the drillers called tying the cutters. That was the sole object.

I have no personal knowledge of what was done with the reamer by the El Moro Oil Company at Whittier. The work at Newhall was done within a year of that time to the best of my recollection. I was in the derrick at Newhall possibly a half day while the reamer was in operation, it being in operation possibly about half of that time. I do not know the depth of the well or how deep they drilled it. Do not know whether they completed the hole with that reamer or not. I have no idea of the time of year that it was. I do not know whether that reamer was ever operated in that well hole on [119] any other occasion than this one time which I have referred. There was no other reamer like that made in 1908. That last reamer was made at my suggestion. I suggested it to Tom O'Donnell. He never ordered another such reamer. I do not know of Mr. O'Donnell having any other of those reamers manufactured except the first. I never saw that operated. The first reamer was a 7 $\frac{5}{8}$ " manufactured by the Leidecker Tool Company. I never saw it in operation. It was at the Baker Iron Works of this city until a few years ago. I do not know what became of that reamer.

The Wilson and Willard Manufacturing Com-

(Testimony of Arthur G. Willard.)

pany are in the business of manufacturing underreamers, circulating heads, oil-well pumps, elevators and a general line of oil-well tools. My object in going to Newhall was to show the men how to operate the new device, namely, the collar and the key to hold the cutters collapsed [120] while running in the casing. At that time there was a good demand for a substantial and successful underreamer. That demand continues until the present day. It is my understanding that the reamer made by the Wilson and Willard Manufacturing Company in 1908 on O'Donnell's order was shipped to the Octave Oil Company at Coalinga and was used by them, I understand, but I have no personal knowledge. I have seen several Kellerman reamers like "Defendant's Exhibit Kellerman Patent." To the best of my recollection I worked on at least half a dozen of them. There are some of them now in the shop of the Wilson and Willard Manufacturing Company which were sent there for repairs and changes. Kellerman was devising a new trip or means for enabling the reamer to run into the casing. He devised this new trip about three years ago. I do not know whether the Kellerman reamer was satisfactory or not. I have seen underreamers run but I have never used one myself.

Some of the Kellerman reamers which have the new trip on were shipped to Santa Maria. Do not know what became of them after that. The reamers which were at the Wilson and Willard Manufacturing Company were not those which were made by

(Testimony of Arthur G. Willard.)

the Baker Iron Works. With the exception of a few changes, namely, grooves in the backs of the cutters for admitting the wedge which spreads the cutters apart, and the tripping device, there were no changes made to the Kellerman reamers that I know of. The Wilson and Willard Manufacturing Company did not make Kellerman reamers exactly like the drawing shown in the Kellerman patent. The trips were put in at Kellerman's instructions. He also gave instructions as to the widths of the grooves in the cutters. The Wilson and Willard Manufacturing Company has never made any Austrian underreamers. There is very little demand for them. They were not designed to stand up to the work of present day underreamers. In making the O'Donnell and Willard of 1908, neither the locking device, as shown in the patent, or the collar of the original reamer were [121] used in that reamer. The locking device was found to be unnecessary. It was found to have no value in the reamer one way or another. The O'Donnell reamer which was used in Whittier was brought to the Baker Iron Works for alterations and was then sent to Newhall. During the time I was with the Baker Iron Works there was quite a number of different embodiments of underreamers made at that shop. Quite a lot of experiments in underreamers were made at that time, namely, from 1900 to 1905. I did not have copies or catalogues for publication of oil tools and machinery. I have had superintendence of the manufacture of the Wilson underreamers through the Wilson and Willard

(Testimony of Arthur G. Willard.)

Company's plant. We have eliminated the side pins, and the key is substituted in their place. The side pins are those holding the block which supports the spring. Spring actuated rod now has a slot in it lengthwise in which the key is inserted. The lower end of the rod terminates in two wings on which the cutters are attached. The head or wings of this sliding rod are smaller than the keyseat in the shanks of the cutters. The dovetails on the cutters prevent them from sliding out and becoming disengaged from the tee. This is about the only change made to the Wilson reamer, over and above its first design. At no time did we ever use a block on the pin at the lower end of the reamer body. We have made reamers eliminating the use of that pin altogether. We probably made fifty or one hundred reamers without the pin. Am familiar with all of the changes that have been made to the Wilson reamer. The change from the block and pin type to the key was to simplify constructions to enable the operator to remove the cutters with less trouble. The object of the retaining pin at the bottom of the Wilson reamer is to prevent the cutters from being lost in case the tee bar should break. That is its principal object and I do not believe it is needed to strengthen the reamer body. The object in securing the O'Donnell reamer was to use it as evidence in this [122] case. When I referred to the hollow slotted extension of the O'Donnell and Willard reamer I mean stationary partition between the cutters, over which the cutters spread. While it is de-

(Testimony of Arthur G. Willard.)

tachable it could be made solid and I consider it a practical device. Mr. O'Donnell did not enter upon any campaign to introduce the O'Donnell and Willard reamer. He simply paid for the model and then tried the reamers out; used them in his well. He operated or caused to have operated, the three underreamers referred to. To my knowledge he made no effort to place these reamers on the market. After the trial of this O'Donnell-Willard at Newhall on the day to which I referred, it was seven or eight years before I saw it again. I did not see it again until after this suit was commenced. I got it then for evidence. It was found on the property of the O'Donnell Oil Company in the city of Los Angeles, laying on a vacant lot. The O'Donnell Oil Company was engaged in developing oil territory. My reason for not making further efforts to manufacture the O'Donnell and Willard reamer was that I became associated with Mr. E. C. Wilson and I considered the Wilson reamer a better reamer than the O'Donnell and Willard reamer. It was because we were engaged in business together in the manufacture of the Wilson reamer that I made no further effort to manufacture the O'Donnell and Willard type of reamer. Comparing the O'Donnell and Wilson reamer, the Double underreamer and the Wilson underreamer, I would say: The O'Donnell and Willard reamer has a cutter on each side of the stationary partition, slidably mounted on a tee-bar, the tee-bar slidably mounted within a hollow-slotted extension, with a tapered bowl surrounding the back of

(Testimony of Arthur G. Willard.)

the cutters. The cutters are suspended on a spring actuated tee-bar, whilst the Double underreamer has a cutter on either side of the stationary partition, slidably mounted on a tee-bar, which is slidably operated in a hollow-slotted extension, the back of the cutter extending through the side of the mandrel, the cutters being provided with dovetailed shoulders [123] fitting in tapered dovetails in the lower end of the reamer, I should say fitted on the taper dovetail on the lower end of the reamer. Its cutters are suspended on a spring-actuated tee-bar. The Wilson underreamer has a cutter on each side of the forked mouth underreamer with projecting lugs used as spreading bearings, slidably mounted on a tee-bar. The cutters are suspended on a spring-actuated tee-bar. The Double underreamer resembles the O'Donnell and Willard underreamer more closely than it does the Wilson underreamer. The only object in pocketing the hole of the reamer made in 1908 for myself and Mr. O'Donnell was to allow the underreamer to be lowered in the casing without tying the cutters. Before that it was necessary to tie the cutters. In designing those pockets in the bowl of the O'Donnell and Willard reamer it left the shoulder at the upper end against which shoulder the ends of the cutters engage while the reamer was being lowered through the casing. Mr. O'Donnell is the superintendent of the American Petroleum Company and a large stockholder in that company; the American Petroleum Company has been drilling

(Testimony of Arthur G. Willard.)

wells for the past four years. I know they are drilling wells right along.

I was in Coalinga about a week ago but was not on the American Petroleum Company's lease. I do not know what kind of underreamers they use. The Wilson reamer has slots in the sides of the mandrels through which the backs of the cutters extend. The O'Donnell and Willard reamer has no such slot. The Wilson reamer has dovetails at the sides of the walls through which the backs of the cutters extend, but the O'Donnell and Willard has not unless you should cut a side out of the reamer body. That is the only difference.

Q. 357. What was the purpose of what you have termed the "clotted extension" in the O'Donnell & Willard reamer?

A. It was used as a spreading-bearing for the cutters, to tilt the cutters over when being lowered into the well, and to [124] expand the cutters when the reamer was in position for reaming. It was slotted to permit the T-bar to work perpendicularly. It also formed a partition between the two cutters to hold them in position.

Q. 358. Was such partition necessary?

A. Yes, sir.

Such a partition is not necessary with the Wilson reamer. However, it is necessary in the Double underreamer. Mr. Wilson and I have been associated together in the Bakersfield Iron Works and our purpose in organizing the Wilson and Willard Manufacturing Company was to go into the business

(Testimony of Arthur G. Willard.)

of manufacturing oil well tools and machinery. The slot in the Wilson reamer to which I refer is the slot about three-eighths of an inch wide and about two inches long extending through the body, the lower edge of which is about two inches above the fork. It is a slot for the key. This slot, of course, has no dovetails. If I referred to dovetails on the slot in answering previous questions it was because I did not understand the question. The slot in which the cutters are mounted, if such can be called a slot, is an opening clear through the mandrel. There is no other slot in the Wilson underreamer body through which, or within which, the cutters could play in tilting or moving, other than the opening between the bearings at the lower end of the mandrel.

Testimony of E. C. Wilson, for Defendant.

E. C. WILSON testifies as follows:

My name is E. Clement Wilson; age, forty-two years; residence, 734 Berendo Street, Los Angeles. Occupation, president of the Wilson & Willard Manufacturing Company. That company is the defendant in this suit. I have been president of that company since its organization in 1907. Our business in the manufacturing of oil well tools, chiefly, among which we manufacture the Wilson underreamer. The Wilson underreamer is covered by a patent [125] issued to me in July, 1906. I produce the original copy herewith #827,595, issued July 31, 1906, to E. C. Wilson. Same is offered in evidence. The reamer as we are now manufacturing it is slightly modified from that shown in the patent

(Testimony of E. C. Wilson.)

but the changes are minor and have only to do with means for suspending the cutters.

In probably the year 1901 or 1902 I first took notice of underreamers and their use. At that time I was employed by the Baker Iron Works of Los Angeles and was price clerk for them. In that capacity I made frequent charges for underreamers which were sold or which were repaired. The Baker Iron Works at that time was manufacturing and selling the Austrian underreamers. They also made one or two other makes or inventions of underreamers, but the Austrian was the one they made a regular business of manufacturing.

The Austrian underreamer had been used in foreign countries, and I was informed by Mr. John Eaton, now deceased, and who was formerly president of the Oil Well Supply Company, that his company was the first one to introduce that underreamer in the United States. The reamer was used and sold and advertised pretty generally throughout the oil fields of the United States. I have discussed it with drillers who have used it in practically every field in the country. The underreamer was used in California, to my own knowledge, quite extensively. In fact, there was only one other reamer at the time that seemed to be any rival of the Austrian, and that was a reamer known as the Swan. The Austrian underreamer had its advantages, in that the cutters expanded out to a great extent, which enabled it to very materially enlarge the hole. It was not very strong, and had to be run on the short stroke of the tools, and

(Testimony of E. C. Wilson.)

generally with a sinker-bar instead of with a stem. But it did enlarge the hole, as I have been informed by many of the men who at that time were customers of the Baker Iron Works. [126]

I was employed by the Baker Iron Works from the years 1897 until 1904. During that time I came in personal contact with the Austrian underreamer. During my service with the Baker Iron Works I was virtually given control or management of the sales department of the Oil Well Tools. We sold the Austrian underreamers to the various supply houses also to oil operators. I should say from fifty to one hundred of the Austrian underreamers were made while I was acting in that capacity. They were all shipped or delivered to different firms. We sold to the Fairbanks-Morse Company, California National Supply Company, Union Hardware & Metal Company, and many oil companies among them were the Central Oil Company of Whittier, The Columbia Oil Company of Fullerton, in fact every company operating in those days were using the Austrian underreamers. Many of these companies had several of these reamers.

While managing the Bakersfield Iron Works at Bakersfield, I frequently came in contact with Austrian underreamers. The Bakersfield Iron Works had some of them for rent, and they were used by oil companies in the fields. Since severing my connections with the Bakersfield Iron Works in 1909 I have not seen Austrian underreamers in use.

(Testimony of E. C. Wilson.)

The first Swan underreamer I came in contact with was probably in the year 1901. It was received by the Baker Iron Works for repairs, and we made new cutters for it. It was shipped back to the Company at Newhall. We had several of the Swan reamers for repairs, I mean the Baker Iron Works. These reamers were like the reamers covered by patent #683,352. That was prior to March 1904. I don't remember of ever seeing a Swan underreamer in the field or in the shops except those that were sent in to the Baker Iron Works for repairs and those I saw in the store of the W. T. McFie Supply Company, which was prior to the time I went to Bakersfield in March 1904. [127]

My first step toward the invention of the Wilson underreamer covered by the Wilson, underreamer patent was while I was with the Baker Iron Works, probably during the year 1902 or 1903. My acquaintance with oil-well men frequently led to conversations, discussions, or different tools in use, and there was a frequent reference to the need of a satisfactory underreamer. There was scarcely ever a reamer sent into our shop for repairs that did not lead to a suggestion by some driller or some superintendent that somebody should devise an underreamer which would stand up to the work. I took occasion to ask them what the faults were, and what the weaknesses were, and as at that time the Double underreamer was coming into use that reamer was probably referred to more often than any other. I was told that that underreamer's cut-

(Testimony of E. C. Wilson.)

ters were too narrow, that they did not expand out to sufficient width to ream the hole large enough, and that its narrow cutters had a tendency to "Key-way" the hole, as they termed it. They also said that the middle joint was objectionable, as several of the companies lost the lower half of the Double underreamer in the hole, and they considered that joint weak. They also stated that it was a hard matter to get the Double reamer down in the hole; that they had to tie the cutters together in order to do so, in many cases. And they also said that the cutters themselves were weak; that they bent in the shank, and frequently broke, and portions of the cutters were lost in the hole. They also told that the key and mandrel by which the cutters were suspended was a weak device and should be strengthened some way or other. I asked some of them what opportunity there would be for an invention in that line, and they said that they believed the field had not been exploited, that somebody would come along some time and devise the right kind of an underreamer. I was a poor boy and on a small salary, and it occurred to me that there was an opportunity to make some money, and I commenced to study underreamers and what the requirements were, and tried to devise new ideas and new arrangements, and, if possible, to overcome the faults. I presume [128] I worked on that underreamer for a year before it commenced to formulate itself into any definite shape. I had sketches and drawings in my pocket which I had worked on at odd times,

(Testimony of E. C. Wilson.)

and until, finally, it commenced to assume a certain definite form, and after I had satisfied myself that my design was about right, I made working drawings and studied them over very carefully. I laid these drawings out to scale to see that I would have the right amount of expansion and the right amount of stock properly distributed to stand the strain. I finally had one made up, an embodiment of my design, at the Baker Iron Works' Shop.

The information on which I relied in determining the state of the art at the time I designed my underreamer was from catalogues and from information which I received and gathered from oil well men who were using underreamers. I also was more or less familiar with the underreamers manufactured at that time, including the O'Donnell & Willard underreamer. While I was working on the design of the Wilson underreamer I was informed by Mr. Willard that he and Mr. O'Donnell had applied for a patent on the underreamer which they had made. I believe the first reamer they had made was made somewhere in the east. Since that time I have examined the O'Donnell & Willard Patent #762,435. Since that time I have seen underreamers constructed in accordance with the O'Donnell & Willard underreamer patent. I have examined the O'Donnell & Willard reamer.

The O'Donnell & Willard underreamer differs from the Wilson underreamer, in that it has for its spreading-bearings an extension or wedge-shaped partition, which is hollow, to receive a spring or

(Testimony of E. C. Wilson.)

spring-actuated key or T-rod, and it has a slot in it, through which slot the key or T operates vertically as the slips or cutters are drawn up or down, as the case may be, when in operation. The O'Donnell & Willard underreamer has tapering pockets into which the cutters fit. The cutters differ from those of the Wilson underreamer, in that they have only one bearing-face, which strikes against the spreading wall or hollow slotted extension. [129] The cutters of the O'Donnell & Willard underreamer take their thrust-bearing on the upper face of an annular shoulder on the cutters, also a portion of the thrust is taken at the upper end of the cutter, while with the Wilson underreamers the thrust-bearing is taken at the upper end of the shank of the cutter only. The O'Donnell & Willard underreamer retains its spring in place by means of this hollow slotted extension, which is itself detachable, which serves the purpose of the spreading-bearing for the cutters, also as a seat the spring, and, furthermore, as a guide for the spring-actuated rod and key. The Wilson underreamer differs from the O'Donnell & Willard underreamer in several very material points: First, that the expansion of the cutters is accomplished in an entirely different way.

Instead of having a hollow slotted extension or spreading-bearing for expanding the cutters, it has two prongs or extensions or projections which extend down from the lower end of the body. These prongs have retaining shoulders on the inner walls of same and the lower ends of the two prongs termi-

(Testimony of E. C. Wilson.)

nate in wedge-like projections which themselves form the spreading means for the cutters and also serve as the bearings for the cutters when the cutters are expanded in the reaming position, thus holding the cutters firmly in reaming position. The spring and T of the Wilson reamer are suspended in place by means of a collar, which collar was in turn held in place in the reamer body by means of dowel pins or screws. Unlike the O'Donnell & Willard underreamer, there was no portion or part of the reamer body itself interposed between the cutters when the cutters themselves were collapsed, ready to run into the casing, while with the O'Donnell & Willard underreamer, the hollow slotted extension still remained between the two cutters when the cutters were collapsed in position for running into the casing. The cutters of the O'Donnell & Willard underreamer, after being drawn downward, compressing the spring to do so, tilted over this hollow slotted extension, closing them together; but with the Wilson [130] underreamer, the cutters collapse by simply drawing them down until the shoulders of the cutters were below the spreading-bearings or extensions, which are the lower terminations of the forks of the reamer body. The cutters do not actually tilt over any bearings or any stock of the reamer body interposed between the cutters. In this way its collapsing action differed very materially from that of the O'Donnell & Willard underreamer. When the cutters were drawn down in their collapsible position, there was no material in the reamer

(Testimony of E. C. Wilson.)

body over which they could tilt, as they were below any such stock. The Wilson underreamer has no feature in its construction whatever which in any way resembles this hollow, slotted extension or stationary wedge used by the O'Donnell & Willard underreamer. The space occupied by this wedge or hollow slotted extension in the O'Donnell & Willard underreamer is an open cavity in the Wilson underreamer; there is no material there at all. In fact, that open cavity here would be the space between the two forks of the Wilson underreamer. Another thing, the Wilson underreamer employs a bolt or pin which extends across the mouth of the underreamer, extending from one prong to the other and which acts as a safeguard against the loss of cutters should the T to which the cutters are attached be broken. There is absolutely nothing like that device on any other reamer, particularly not on the O'Donnell & Willard underreamer. The Wilson underreamer cutter has an enlarged body which forms shoulders extending at right angles to the shank of the cutter. These shoulders are so shaped that they ride on these wedge-like extensions or projections of the prongs, and when the cutters are collapsed together, they are held in that position largely by these shoulders resting or bearing against the beveled ends of these wedge-like projections. There is no similar device on the O'Donnell & Willard underreamer. There are other minor differences, but, in the main, those are the chief differences between the O'Donnell & Willard underreamer and the Wilson underreamer.

(Testimony of E. C. Wilson.)

I [131] might add that the body of the Wilson underreamer is one single piece; it has no middle joint in it.

Q. 57. Please answer, similarly, with respect to the underreamer "Defendant's Exhibit Willard & O'Donnell Underreamer."

A. Well, it is evident from a glance at that reamer that its cutters were very broad and that it will overcome at least one of the faults of other underreamers in use at that time by having broad cutters instead of narrow ones.

Q. 58. Aside from that, do you or do you not consider that the other features of advantage remained still to be acquired or produced after the invention of the Willard & O'Donnell underreamer?

A. Yes, sir; those objections remained to be overcome.

Q. 63. Did you ever at any time arrive at a definite determination whether or not your company should manufacture these Willard & O'Donnell underreamers? A. We did.

Q. 64. Please state what the determination was.

A. We concluded that the Wilson underreamer was an advantage over the O'Donnell & Willard underreamer in design, and that it was altogether a better designed underreamer and that it was useless for us to attempt to put the O'Donnell & Willard underreamer on the market in competition with it.

A. 66. The principal differences between the O'Donnell & Willard underreamer and that of the double underreamer are merely differences of slight

(Testimony of E. C. Wilson.)

importance. The O'Donnell & Willard underreamer retains the spring in position by means of a detachable piece of the body. The double underreamer retains the spring in place by making the reamer body in two pieces, the spring being inserted into one and held in place by screwing the two pieces together, as they have a threaded joint. The O'Donnell underreamer has a bowl-like mouth, and the Double reamer is just the same except that certain portions of the outer face of the bowl have been removed, forming open pockets for the cutters. Both reamers are [132] known as what we call end-underreamers, that is, the cutters are attached to the lower end of the reamer body instead of at the sides of the body and above the lower end, such as is found in the Austrian underreamer and the Russian underreamer. Both reamers have spring-actuated cutters, which are slidably mounted, and which, in order to collapse the cutters, it is necessary to pull the cutters downward, compressing the spring on which they are suspended, and the cutters tilt over a stationary wedge or partition, which has a hole lengthwise, or vertically, and which is slotted or mortised through from one side to the other of the stationary wall or partition, forming a slot and giving rise to the name, "hollow slotted extension." Both reamers have cutters attached to a spring-actuated rod or mandrel, and the cutters have recesses or pockets in the backs of same to receive the key which extends through the rod and by which key the cutters are suspended. To set the under-

(Testimony of E. C. Wilson.)

reamers preparatory to running into the casing, the same operation is necessary; the cutters are drawn downward until they collapse together by tilting over the hollow slotted extension; they are retained in the collapsing position by means of a ring or a collar; and then the reamer is inserted into the casing. As the reamer and tools are started down the casing, the ring or collar is then removed and the casing keeps the cutters collapsed together while the reamer is on its descent in the casing. As soon as the reamers emerge from the lower end of the casing, the tension of the spring, drawing upward, and consequently tending to lift the cutters upward, expands the cutters in the reaming position, as they are wedged out in that position by means of the stationary wall or hollow slotted extension, and are held in reaming position by the same hollow slotted extension. The cutters are then expanded to a much larger diameter than the inside diameter of the casing through which they just passed. This expansion of the cutters enables the operator to enlarge the hole in which the casing is being lowered, and which hole has previously been drilled by the usual form of [133] drilling bit. When the reaming required has been accomplished, or when it is necessary for any other reason to withdraw the under-reamers from the hole, the tools are withdrawn upward until the cutters strike against the lower end of the casing or the casing-shoe. This draws the cutters downward, compressing the spring, and allows the cutters to tilt or collapse over the hollow slotted

(Testimony of E. C. Wilson.)

extension or stationary wedge until they have again assumed a smaller outside diameter than that of the internal diameter of the casing, and the reamer and tools are then withdrawn into the casing and removed at the top of the hole. The reaming operation, the method of setting the reamers and running them in or out of the casing, are precisely the same.

A. 67. The Double underreamer has a body of two pieces, which pieces can be joined together by means of threads. The Wilson underreamer has a body of a single piece, there being no joint in it. The Double underreamer body has a hole drilled in the lower half of the same, extending vertically entirely through from one end to the other. It is counter-bored or enlarged at the upper end of the lower half of the said body to admit of the spring and spring-actuated rod. The lower end of the enlarged hole forms the seat for this spring. In order to remove or replace this spring and spring-actuated rod, it is necessary to unscrew the body at this middle joint. This device is very different from the Wilson underreamer body, as the hole does not extend completely through the Wilson reamer body. The spring is inserted at the lower end or the mouth of the reamer instead of at a middle joint, as is the case with the Double underreamer. The spring-actuated rod of the Double reamer has a slot or mortise extending through it from side to side, and through this slot or mortise a detachable key is inserted, and which key extends through the spring-actuated rod and into the recesses or pockets of the cutters. The

(Testimony of E. C. Wilson.)

Double underreamer body also has a projection or a stationary wedge, wall, or partition, extending below the upper [134] ends of the dove-tail pockets for the cutters; in other words, below the thrust-bearings on the reamer body. The hole through which the spring-actuated rod operates, extends also through this stationary wall or partition, making the same hollow. There is a slot mortised through from one face to the other of this stationary wall or partition, which slot is for the purpose of permitting the key to which the cutters are attached to travel vertically as the spring is compressed or extended. The lower end of this hollow slotted extension has tapering faces, making the projection or extension wedge-shaped, and which is for the purpose of expanding the cutters. The Wilson underreamer body has no such projection in its construction. There is no slot in it through which the key is to operate; and, furthermore, it has no detachable key in contact with the cutters. Instead of this hollow-slotted extension which acts as a spreading-bearing for the cutters, there is nothing but open space in the Wilson underreamer body. It certainly is not hollow, nor is it slotted, and consequently is neither hollow nor slotted nor hollow and slotted. The Wilson underreamer body terminates in two prongs or forks, which prongs or forks extend downward below the thrust-bearing, namely, that bearing against which the upper ends of the cutters bear when the reamer is in operation. These two prongs have shoulders projecting inwardly on their inner faces. These

(Testimony of E. C. Wilson.)

shoulders form bearings and rest against similar shoulders projecting at the shanks of the underreamer cutters and by means of which shoulders the cutters are prevented from swinging outwardly beyond a certain limit. The lower ends of these two prongs or forks terminate in tapering wedges, which wedges form the spreading means for the cutters. It is by these wedges that the cutters are expanded in the reaming position and held in reaming position while in operation. The difference in the Wilson underreamer body and the Double underreamer body is very apparent when it is remembered that the Wilson reamer body terminates in two [135] prongs forming a fork, while the Double underreamer body terminates in a hollow-slotted extension. The construction is so very different that different machinery is required to do the work advantageously. With the Double underreamer, the mouth or lower end of the body is machined out by a drill-press and planer; with the Wilson underreamer the lower end or mouth is machined with a milling machine—an entirely different course in manufacture. The shoulders or dovetails of the Double underreamer body are angular, having a tendency to project upwardly and inwardly. The shoulders on the inner forks of the Wilson underreamer body are parallel. The shoulders in the Double underreamer body are formed by planing grooves on the inner faces of the body and at either side of the stationary wall or partition or hollow-slotted extension. There are no such grooves to be found on the prongs or body

(Testimony of E. C. Wilson.)

of the Wilson underreamer body. The cutters of the Double underreamers are so constructed that the sides of the shanks or edges of the shoulders of same, also the faces of the main body of the cutter, are on a plane; in other words, the extreme outer edges of the shanks and the edges of the main body of the cutter, on the sides of said cutters form a straight line. With the Wilson underreamer the shanks are proportionately much narrower than those of the Double, but the body is much wider. The body extends at right angles to the shanks, which forms projecting shoulders on the Wilson cutters. This makes the cutting surface of the Wilson underreamer cutters much greater than that of the Double cutters and enables the operators to cut more of the circumference of the hole at each stroke of the tool, and also prevents key-seating, as it is commonly termed by drillers, namely, cutting grooves in the walls of the hole, into which grooves the underreamer cutters have a tendency to follow at each stroke of the tools, and which, in turn, prevents the complete reaming or enlargement of the full circumference of the hole. The Double underreamer cutter, in order to be tilted [136] over the stationary wall or partition or hollow-slotted extension, has V-shaped grooves planed in the back of the cutter extending crosswise with the cutter. There are no such grooves to be found in the Wilson underreamer cutter, nor are they necessary. Without these grooves the Double underreamer cutters could not collapse at all over its hollow-slotted extension. These grooves leave the

(Testimony of E. C. Wilson.)

shank of the Double cutter weak at that point, as a very material amount of the stock is thus removed. The cutters very frequently bend and break at that place. With the Wilson cutter this fault is overcome, as the stock is left intact the full length of the back of the shank. The spreading-bearings or extensions of the forks on the Wilson underreamer body are very wide, and this gives the cutters a longer swing, as they are collapsed or expanded, and consequently they collapse more completely together when running down the casing and expand out to a wider position than those of the Double. This enlarges the hole to a greater diameter than can safely be done with the Double, as, to obtain the same amount of expansion, it would be necessary for the Double reamer to make a wider or thicker hollow-slotted extension, and, in turn, to remove a still greater amount of stock from the backs of the Double cutters in order to permit them to collapse over the increased thickness of the hollow-slotted extension. This would weaken the Double cutters still more and would render the reamer practically useless, as it would then be altogether too unsafe to run it into the hole. The spring-actuated means by which the Wilson underreamer cutters are suspended, instead of being a rod with a hole mortised in it, and a detachable key, is a single forging. The T of the Wilson underreamer is forged out of a single piece of steel. It is of much greater strength than the device used by the Double underreamer. It is impossible for the suspension means to work loose as does

(Testimony of E. C. Wilson.)

the key of the Double underreamer, and being of much greater strength is much less apt to be broken and thus lose a cutter or [137] both cutters in a hole. If the solid-forged T of the Wilson underreamer should break above the head, it is impossible to lose the cutters, as the safety-bolt will hold them all in place, the cutters and head of the T being so interlocked that it is impossible to remove them while the safety-bolt is in place. If one side of the T should be broken, one of the Wilson underreamer cutters would be lost, but the other one would be held firmly in place on the opposite side of the T. If the key of the Double underreamer should be broken, both cutters are sure to be lost in the hole as there is no safety device, such as is found in the safety-bolt of the Wilson underreamer, to hold those cutters in place. The cutters of the Double underreamer, when collapsing over the spreading-bearing or hollow-slotted extension, tilt over same, but, as previously explained, when the Wilson underreamer cutters collapse together, there is no stock or material in the reamer body interposed between the Wilson cutters over which they could tilt, and hence, they do not tilt over their spreading-bearings as is the case in the Double underreamer. The Wilson underreamer is different from the Double in another important feature, and that is the ability to realize several uses of the reamer body. When the spreading-bearings of the Wilson underreamer body have worn until the cutters are considered too loose, the spreading-bearings or wedge-like projections at the

(Testimony of E. C. Wilson.)

lower ends of the two forks or prongs are cut off and the mouth of the reamer body is machined further back and new spreading-bearings are machined onto the ends of the forks, new holes are drilled in the body, and the body is then just as good as new. This cannot be done with the Double underreamer, and is a feature, of itself, unique from any other make of an underreamer.

The reason why the Double underreamer body cannot be re-machined and used the second time is due to the fact that in cutting off the worn portions preparatory to re-machining, it would be necessary to cut the lower end of the hollow-slotted extension off entirely. That would leave the key-slot open clear through to the [138] end, and consequently there would be no stop, or no means of stopping the downward compression of the spring except the spring itself. That would allow the cutters to be withdrawn entirely out of the mouth. The only way that body could be used at all would be to cut the entire mouth off of the lower end of the body and re-machine an entire new mouth. This would entail as much expense for the shop work as is necessary to make a new body; hence, there would be no advantage in re-machining.

Another important difference between the Double underreamer and the Wilson is the difference in results caused by the wear of the cutters on the body. The Double underreamer, having a hollow slotted extension, takes up the wear, of course, the full width of the hollow slotted extension. This wears

(Testimony of E. C. Wilson.)

the spreading-bearings on the body until they are in some instances quite thin. The downward stroke of the key in its slot, when the cutters are collapsed, allows this key to strike on this bearing portion which is being worn thin by the cutters and splits its way entirely through the lower end of the reamer body; in other words, elongates the slot, until it splits the lower end of the body. This is one of the most notable weaknesses of the Double form of construction. When such occurs, the reamer is useless, as the cutters can then be very easily lost off the reamer body, even though the key and rod have not broken, as the cutters can be drawn entirely out of the pockets in the reamer body. Some attempt to repair the body by riveting steel plates across the end, thus building up the worn faces and forming a new stop for the downward thrust of the key; but I am informed that the job is never very satisfactory, as the plates thus riveted on have a tendency to shear the rivets.

Mr. LYON.—(Interrupting.) We move to strike that portion of the answer from the record and exclude it from consideration in which the witness says, "I am informed," on the ground that the same is incompetent, not the best evidence, hearsay; and [139] request that the witness confine his answers to matters which are within his own personal knowledge.

A. (Continuing.) It is very evident that hard steel plates depending altogether on rivets through said plates would have a great shearing

(Testimony of E. C. Wilson.)

strain on these rivets when repeated heavy blows are applied to the upper edge of the plates driving the plate against the rivets. There is no such trouble as these referred to with the Wilson underreamer, as all of the wear which is necessary to keep the cutters expanded to reaming position is applied to the spreading-bearings at the lower ends of the forks. There is no amount of wear which could be applied to those bearings which would in anywise affect the safety of the underreamer, as there is in the case of the Double, there being no slot in the Wilson underreamer body for the suspension-means to travel in; consequently there is nothing for the suspension-means to strike against, the downward compression of the spring being limited, not by the lower extremity of the key-slot, as in the case of the Double, as the Wilson has no such key-slot, but by a piece of pipe which is placed over the T-bar and underneath the spring. This pipe is cut to such a length that when the spring is compressed to the point desired, the pipe strikes against the nut on the T-bar and prevents the spring from compressing any farther. This is a very different operation from that of the Double, as will be noticed. Double has no such pipe in his underreamer to stop this compression of the spring at the proper place. He depends on the bottom of the key-slot.

Another marked difference between the two reamers is the position of these expanding or spreading-bearings for the cutters, in relation to the retaining shoulders on the reamer body, or dove-

(Testimony of E. C. Wilson.)

tails, as they are commonly termed. The Wilson underreamer is so constructed that these spreading-bearings project downward a very considerable distance below these dovetail shoulders. Thus, [140] the cutters are braced, down close toward the lower end, at which point of the cutters the greatest strain is applied, namely, the strain which tends to crush the cutters inwardly as they are being used or as they are reaming in a hole. The hole has a tendency to form into a funnel-shape, thus constantly crushing the cutters towards each other. That is the reason why it is necessary to have the cutters firmly braced apart by means of some form of a spreading-bearing while the cutters and the reamer are in operation. Otherwise this inward thrust or strain on the cutters would have a tendency to keep them almost constantly collapsed so that they would not enlarge the hole to the size required. And, as previously stated, the projecting ends or spreading-bearings on the ends of the prongs of the Wilson underreamer body extend downwardly to a point where this strain above referred to is taken up at the strongest portion of the underreamer cutter and allows the strain to have a very short leverage against the cutter. This leverage, in most instances, with the Wilson underreamer is probably not more than one and one-half to two inches, while the leverage with the Double underreamer applied against the cutter is, in most instances, from four to five and sometimes six inches. Thus, the strain applied to a Double cutter, owing to the increased

(Testimony of E. C. Wilson.)

leverage on same, is probably twice if not three times as great as the same strain would be on the Wilson underreamer cutter. And this is due to the fact that with the Double underreamer this spreading-bearing does not project below the dovetails or retaining shoulders on the reamer body; in other words, the lower end of their spreading-bearing is virtually flush with the lower ends of the retaining shoulders or dovetails of the Double body. This feature, alone, is one of the very great advantages we claim for the Wilson underreamer and is one of the reasons why there are so very few Wilson underreamer cutters that are ever bent or broken.

Another point of very marked difference is the difference in [141] the angles of the bearing-faces of these spreading-means on the Double and on the Wilson underreamer body. The faces of these spreading-bearings on the Double underreamer, namely, the faces of the hollow slotted extension on which the Double cutters rest when in the rearing position, are parallel, while those on the Wilson underreamer body are tapered; in other words, project downwardly and inward. The advantage that the Wilson has over the Double is as follows: When running an underreamer there is a constant tendency for the cutters to wedge in the shell or in the hole in which it is reaming. With the Wilson underreamer, the first upward action of the tools frees the cutters from their wedged position in the hole, as they commence to collapse instantly upon the return stroke of the tools. They free more easily at

(Testimony of E. C. Wilson.)

the initial action of the return of the tools for the reason that the compression of the spring at that point is very much less and consequently requires a much less force at the beginning of the collapse stroke than is required at the lower end of the collapsible stroke of the cutters. With the Double underreamer the cutters do not commence to collapse until they have been drawn downward on their parallel faces to almost the entire length of the compression stroke of the spring; in other words, the Double cutters do not commence to collapse until a very heavy tension has been placed on the spring. They then collapse very quickly, and at a time when a comparatively high tension is on the drilling line. The elasticity of the drilling line, when under a heavy strain suddenly relaxed, causes the line to jerk the tools high in the hole; they will then descend with much force into the hole on the return stroke of the beam; and has a greater tendency to wedge in the hole at that stroke than before, and this operation is repeated at every stroke of the Double underreamer—in other words, the Double underreamer has a great tendency to plunge in the hole and is a fault which is practically overcome by the Wilson reamer by reason of its tapered spreading-bearings. [142] This feature alone is one very often mentioned as among the advantages the Wilson reamer has over the Double.

Another great advantage of these tapered bearings is the ease with which the Wilson underreamer is withdrawn into the shoe or casing. The cutters

(Testimony of E. C. Wilson.)

commence to collapse the moment they strike the shoe, and gradually close together until they are withdrawn into the casing. With the Double the cutters do not collapse until the full strain necessary to collapse the spring has been applied, and, in so doing, the bearing-shoulders very often wedge in the shoe, making it necessary to hook onto the temper-screw and jar the underreamer into the shoe. In so doing, much risk of breakage is incurred, as the strain is applied directly to the cutters and suspension-means, and many a Double underreamer cutter is lost in the hole, or at least bent, in withdrawing the underreamer into the shoe.

It will be noticed that these various differences between the construction of the Double underreamer and that of the Wilson all have a purpose. In designing the Wilson underreamer I had very clear ideas of what would be necessary in order to overcome the faults of the Double. Every change I have made was with a view to strengthening the cutters or to widen them, give more cutting surface or to enable the cutters to be expanded to a wider position, to guarantee a well-reamed hole, and to make the suspension-means stronger than that of the Double, and to overcome the complaints due to the middle joint of the Double, to make stronger dovetails on the reamer body and on the cutters, to make stronger shanks on the cutters, to make a reamer which would run in or out of the casing more freely and avoid the necessity of tying the cutters together, as was the case with the Double, when running down

(Testimony of E. C. Wilson.)

the hole, and to make an underreamer which would give the maximum amount of service, which we can do by re-machining. I also realized that it would be necessary to use an entirely different form of construction, [143] otherwise I would infringe on somebody's patent. Consequently, I started in with my invention from an entirely different source, namely, a type of underreamer body known as the forked mouth underreamer body, which was in strong contrast to those reamers using hollow slotted extensions or spreading-bars or stationary walls or partitions interposed between the cutters.

(Continuing.) I have shown some of the main differences in construction between the Double reamer and the Wilson underreamer. There are other differences, but they are not so important.

I do not find in "Complainants' Exhibit Double Patent" the shoulders at the sides of the slotted extension and the lower end of the mandrel body of "Complainants' Exhibit Double Underreamer" nor the shoulders at the sides of the prongs, and above the spreading surfaces; these latter I find in "Defendant's Exhibit Wilson Underreamer Patent"; complainants have not always manufactured underreamers with such dovetail shoulders above the spreading-portion of the slotted extension. They have been using the retaining shoulders or dovetail shoulders on their reamers ever since they were first made, but they have made a change in the form of the spreading-bearing and that change was made not until almost two years after my reamer was on

(Testimony of E. C. Wilson.)

the market. The Double underreamer as originally made, and made for some time after mine was first out, did not have this V-groove cut on either side of the spreading-bearings and into the retaining shoulders or dovetail shoulders. Looking at the reamer body from the side, they terminated in two faces, angular faces forming a V-shaped projection, and that was their form of construction. They didn't have these V-slots.

I herewith produced an underreamer made up with a V-shaped groove forming this extended bearing. I obtained this underreamer in a lot of second-hand oil well machinery which we bought. Think we bought it of Jamison, the second-hand dealer. It is identical in construction with dozens and dozens of Double reamers I have seen [144] in use and have seen on sale in the different stores. I know of no other firm than the Union Tool Company, complainant in this case, who has been manufacturing reamers of that type. I have seen reamers of that type in McKittrick, Maricopa, Coalinga and other oilfields of the State of California.

The Double underreamer having these relatively narrow cutters and the particular formation at the lower end of the mandrel has not been in general use for at least three years, to my knowledge, this later type of reamer having superseded it, although I understand there are still some of these reamers being made and sold, although the demand is for this reamer here. (Complainants' Exhibit Double Reamer.) It was in 1907 or '08, I should say, that

(Testimony of E. C. Wilson.)

this reamer first came out, that he made his change and virtually abandoned this older type of reamer.

The Wilson underreamer, as previously stated, were manufactured and sold prior to the time the first of these Double underreamers with the V-shaped notch or slot extending the bearings, and with the wide cutters to co-act therewith, were first made.

Q. 88. (By Mr. BLAKESLEE.) Please particularly define what, if any, relation exists between the retaining-pin or bolt, or safety-bolt, which spans the chamber between the prongs at the lower end of the Wilson underreamer and the cutters of the Wilson underreamer.

A. The pin has no relation whatever with the cutters. Its object is simply a safety-bolt and acts as a safeguard against loss of cutters. We have in a few instances had complaints, at an early time—not for a long time, but when this reamer was made, which was a long time ago—that the Wilson underreamer gave trouble to get down the casing, and we found that the trouble was due to the fact that the machinist was not drilling the hole for the safety-bolt at the proper position in the reamer body; they were drilling the holes too far down toward the lower end of the reamer body. When the bolt was in place in a body with the holes drilled in the wrong position in that manner, the cutters [145] would strike against this bolt or strike against this safety-bolt and prevent them from collapsing to their fullest extent. Of course, that was a mistake; the bolt

(Testimony of E. C. Wilson.)

should have been placed higher up on the reamer body to a position where the cutters could not touch the bolt at all when they were being collapsed or being expanded for position. The bolt has absolutely nothing to do with the cutters, and it was a serious mistake when that hole was placed in such a position that the cutters could touch that bolt when being collapsed together or when being expanded into reaming position. I might add that acting on the recommendation of one of our very good customers, we discontinued the use of that safety-bolt altogether, at one time, and made probably twenty-five underreamers, probably more, without that safety-bolt altogether. This brought forth the complaint from one customer that the T-bar he was using had broken, showing a flaw in it, and that the party lost the cutters in the hole, simply because we didn't have this safety-bolt in that body. He notified us that he would use no more Wilson underreamers that didn't have that safety-bolt, to prevent such an accident again. After that we have always made the reamer bodies with the safety-bolt in them.

Q. 89. Please state whether or not you have ever had any complaints as to the operation of the Wilson underreamer concerning the entrance of any objects or materials encountered in the hole into the space between the prongs and above the retaining-bolt.

A. No, sir, we have never had the slightest trouble in that regard.

Q. 90. Should any such objects or materials enter this space, please state what, in the operation of the

(Testimony of E. C. Wilson.)

underreamer, would occur, and why.

A. To begin with, while that safety-bolt is in place, any solid substances or materials which can enter in the space between the cutters and that safety-bolt is very small indeed and it would require a considerable stretch of imagination to find any materials [146] or rocks or gravel in a hole that has been drilled with a bit in sufficient quantities which would just fit in between those cutters and that safety-bolt and accumulate in there in quantities sufficient to give any trouble. But, even should such materials enter between the cutters and this safety-bolt, they could not remain in there long, as this solid-forged T-bead in each stroke of the tools, having a tendency to act on the compression or tension of the spring, would constantly force or pound out in front of it and out at the mouth of the reamer any materials which would have a tendency to collect in there. I have known Wilson underreamers to chop up length after length of casing, and to run on underreamer cutters of other make, and in all sorts of gravel and boulder formations, and in all the years that we have been in this business we have never had one single complaint of the Wilson underreamer packing up with mud or other debris, rocks or iron, in between the cutters in such a manner as to prevent its cutters collapsing freely and easily when drawing into the shoe.

Q. 91. Will you please state whether it is possible to replace the cutters of "Complainants' Exhibit Double Underreamer" with the cutters of "Com-

(Testimony of E. C. Wilson.)

plainants' Exhibit Wilson Underreamer'' and successfully operate the Double underreamer.

A. No, sir; it would not be possible.

Q. 92. Please state why.

A. As I have previously explained, the Double underreamer body has a slotted extension interposed between the cutters. In order to collapse the cutters over this hollow slotted extension, it is necessary to have a certain amount of the stock or material removed from the back of the cutter. This is done by planing a V-shaped groove across the back of the cutter. This groove forms a pocket or space which allows the cutter to tilt over this hollow slotted extension when it is drawn down to a collapsible position. In order to make the Wilson underreamer work in a Double underreamer body, the first thing necessary to do would be to [147] machine that same V-shaped groove out of the underreamer cutter; otherwise the cutters would not collapse at all. And, again, the Wilson underreamer cutters, as made, have very much longer shanks than those of the Double underreamer and would not fit in the Double underreamer body. That is one of the main differences. There are other slight differences in the way they are constructed. Those differences, alone, are sufficient to prevent their being interchanged.

The operativeness of the Wilson underreamer is effected in no manner whatever by the removal of the safety-bolt.

Q. 94. Have you ever seen a Double underreamer

(Testimony of E. C. Wilson.)

with plates across the sides of the slotted extension, the lower end of the same beneath the slot therein?

A. I have.

Q. 95. As far as your information goes, what was the function of these plates?

A. They were simply the means of repairing broken underreamer bodies. The key had split the lower end of the body, and also the body had been worn by action of the cutter until it was so thin that it made an easy matter for the key to split it out, and which causes a situation that is dangerous—the cutters are liable to be lost—and the reamer is patched up by means of these plates.

The Central Oil Company of Whittier, The Amalgamated Oil Company, The Associated Oil Company are a few of the companies which use both Wilson and Double underreamers. They are using these reamers in Fullerton, McKittrick, Coalinga, and other oil fields of the State of California. There are numerous other companies also using both Double and Wilson reamers. In some instances both underreamers are being used, and some instances they are using nothing but the Wilson reamer.

The Section 25 Oil Company, the Central Oil Company, the El [148] Camino Oil Company are now using Wilson underreamer exclusively. They are located in Maricopa, Taft, Whittier, and the Bakersfield's fields. All in the State of California. There have been instances of serious accidents resulting from the use of Double underreamers. I was informed by drillers, also newspaper articles pub-

(Testimony of E. C. Wilson.)

lished at the time of the incident, the Red Top Oil Company of Coalinga lost the lower half of the Double underreamer in the hole, and after fishing for it for probably a month, decided to shoot it out of the way by using dynamite. Two men were killed in trying to do so. The Section 25 Oil Company a short time ago, operating near Taft, lost the lower half of a brand new underreamer in the hole. That was their first experience with Double underreamer for several months. They had always used Wilson underreamers but being in a hurry for a reamer and not being able to obtain the Wilson, purchased the Double with the result mentioned. The Delaware Union Oil Company near Fullerton, running a 15½" Double reamer broke two Double 15½" underreamers, rendering them useless. They finally lost a set of 15½" Double cutters. They also lost a set of 12½" Double underreamers about the same time. This entailed a very considerable loss to them.

Recalled—Direct Examination Resumed.

(By Mr. BLAKESLEE.)

Q. 106. Will you state fully the objects you had in view and the structural and operative results obtained in and by the provisions of the shoulders upon the lower end of the mandrel or body of "Complainants' Exhibit Wilson Underreamer," beneath which the shoulders on the cutters are disposed when the cutters are in expanded position.

A. I have previously explained that underreamers, to be successful, have to have some solid means of expanding the cutters into reaming position and

(Testimony of E. C. Wilson.)

holding them spread apart to full expanded position while underreaming. That was the object of those projections or wedge-like extensions of the prongs. These projections are so designed that they do that very thing. The cutters [149] having shoulders projecting at right-angles to the shanks, extend out far enough to ride up over and rest upon these wedge-like projections on the ends of the forks of the reamer body.

Q. 107. Please state, if you know, what structural and operative results are obtained by forming the notches in the lower end of the body or mandrel of "Complainants' Exhibit Double Reamer" at the sides of and just above the lower end of the slotted extension.

A. By cutting those notches in the shape that we see them on this Double underreamer, in the exhibit, the old or original Double underreamer body is transferred into one which has projecting bearings which extend downward below the ends of the retaining shoulders or dovetails on the reamer body, and by their projection downward they have a tendency to shorten the leverage on the cutter and thus reduce the strain or leverage applied to the cutters, which strain has the constant tendency to crush the cutters together at each stroke; in other words, by that change in the Double underreamer they have added practically—added the same device that I had in my wedgelike projections at the ends of the prongs of the reamer body. I have previously explained that the further down that bearing can be

(Testimony of E. C. Wilson.)

extended and the closer to the end of the cutter at which the strain is applied, the shorter the leverage is against the cutter, and Double, in making the change to his underreamer, evidently strove to get the benefit of the same device that I had on my underreamer, as he has virtually adopted the same form of construction to that extent.

Q. 108. Can you state whether or not, without adopting this construction, it would be possible to apply to the Double underreamer, as disclosed in the Double patent, the relatively broader cutters such as disclosed in "Complainants' Exhibit Double Underreamer"?

Mr. LYON.—Objected to as leading.

A. No, sir; it would not be a practical thing for him to do so, according to the construction of his old reamer. And there is [150] a reason for that, too. I have never seen a cutter before like that shown in Complainant's Exhibit Double Long Bit.

I think I have seen all of the designs of underreamers that Double has had made in the Union Tool Company's Shop. I have been in their shop three or four times from the year 1900 and probably three until 1901 and 1910. I cannot say definitely but do not believe I was in the shop of the Union Tool Company in Los Angeles within two or three years after it first opened up.

The Baker Iron Works to my knowledge never handled Double underreamers. I probably saw Union underreamers or Double underreamers a year or so, probably a couple of years before I went

(Testimony of E. C. Wilson.)

to Bakersfield. I went to Bakersfield in the year of 1904.

I made a wooden model of an underreamer I was working on the year of 1902. I still have that wooden model but it has been modified and changed considerably. It is a model probably 18 inches long. It was the only model I had made during the years 1902 and 1903. Prior to having that wooden model made I had seen Double underreamers. Don't know whether that was before the issuance of the Double patent or not. I think I met Mr. Lyon in Mr. Townsend's office in regard to a casing spear which I was having patented. I don't remember the date. The wooden model is a different form of reamer from that which I later adopted. I did not altogether abandon the form shown by the first wooden model. I changed the cutters somewhat. I was familiar with various makes of underreamers, not only the Double, prior to making the present Wilson underreamer, I cannot say that the Double reamer was most generally in use at that time. There were other reamers in use, namely, the North reamer, the Kellerman reamer, the Plotts reamer, the Austrian underreamer, the Swan underreamer and others. At that time it was a common discussion among oil well men as to the relative merits of the various underreamers,

The main difficulty with the North reamer, as I recollect, was the fact that the cutters would not remain in an expanded [151] position while reaming. They were liable to and did so far as the opera-

(Testimony of E. C. Wilson.)

tor could ascertain, collapse at times with the driller in underreaming. The first North reamer was probably used in 1899 or 1900. I believe I have never seen the so-called North Improved reamer. I have heard of it. The inventor of that reamer was Edward North.

I do not know how many Kellerman reamers were made. Some of them were made by the Baker Iron Works, some were made by the Union Tool Company.

The trouble with the Kellerman reamer was its means for forcing the wedge, the movable wedge, downward when coming in contact with the casing shoes, so as to permit the cutters to collapse. They had some trouble to get the reamer out of the hole. I don't think it ever gave any trouble to collapse. There was no trouble caused by cutters collapsing when in use as the wedge which expanded the cutters remained between the cutters when in use and the cutters could not collapse.

Operators were not altogether satisfied with them. However, they did do good work as I remember at one time while Mr. Kellerman was drilling a hole near College Street, in this City, I was in the rig when they were running a Kellerman reamer, and I asked the drillers about them and they said they were the best reamer to cut the hole and enlarge or ream the hole that they had ever seen. That was probably in 1899 or 1900. I do not remember the driller's name. I also heard men say that the North

(Testimony of E. C. Wilson.)

reamer was the best reamer in use at that time. At that time the Oil Well Supply Company was handling North reamers, the Austrian reamers, and one or two other makes of reamers.

Q. 180—You have referred to a desire upon your part to get a wider expansion of the cutters. To what degree did you desire to get a wider expansion of the cutters?

A. Merely to meet the common demand of the oil men at that time. They had been accustomed to the old Austrian underreamer. [152] which had a tremendous expansion, and they thought that was one thing lacking in the end—underreamers at the time—they didn't cut out wide enough.

It was common practice with the Austrian underreamer to attempt to use the same sized mandrel with cutter or bits of varying sizes in order to secure the use of one body or mandrel for underreaming under more than one size of pipe; this was also attempted with end-underreamers but the extra strain that was thrown on an underreamer having a small body, using a size larger cutter than intended, which threw, naturally, a greater leverage on the small dovetails of the reamer body, owing to the cutters extending out at a greater distance from the dovetails than would be if used in a body of the size intended for the large cutters, was a detriment. I have known of Wilson underreamer being so attempted to be used. The result I speak of was common to all underreamers operated in this manner.

(Testimony of E. C. Wilson.)

Q. 190. You have stated, in answer to question 12 on direct examination, that when you first took notice of underreamers, in 1901 or '02, you were employed by the Baker Iron Works as price-clerk and the Baker Iron Works at that time were manufacturing and selling the Austrian underreamer and they made one or two other makes or inventions of underreamers. What other makes or inventions of underreamers did the Baker Iron Works at that time manufacture or make?

A. They made the Kellerman reamer; they made a reamer for a man by the name of—I believe his name was Hedley. He was the man who drilled the water-hole out in the West Side fields which was the foundation of the Bimini Hot Baths. I believe his name was Hedley.

As I have stated, the first Swan reamer I ever saw was with the Baker Iron Works of Los Angeles and was there for repairs. I believe it was brought in from Newhall. We made new lugs and [153] the spring actuated projection at the side of the body had worn, namely, the tripping mechanism. I never saw a Swan underreamer run in the hole. Dovetails are for the purpose of holding the cutters from swinging outwardly beyond a certain limit. The corresponding shoulders on the shanks of the cutters bear against the inner faces of the restraining shoulders or dovetails of the Wilson reamer, and stop the cutters from swinging outwardly beyond a certain limit.

Prior to the time I made the first Wilson under-

(Testimony of E. C. Wilson.)

reamer, Allen Craig stated to me that he had difficulty in getting the Double underreamer down in the hole. There were so many men that told me that, that I have forgotten who they were.

Probably every man that I talked with about underreamers at that time made the remark that somebody would come along sometime and make up a satisfactory reamer. They all felt that the field had not been exploited and that there was still room for improvement. I do not remember the exact date. I obtained that information when endeavoring to find out just what an underreamer should be.

It was probably a couple of years before I went North that I saw the first O'Donnell & Willard underreamer. I saw it in the shop of the Baker Iron Works. I do not remember how many times I saw it or how long it was in the shop. The O'Donnell & Willard underreamer which is now in the shop of the Wilson & Willard Manufacturing Company was brought there only a few days ago. I do not know where it came from. I don't remember of talking with anyone as to its use, except possibly Tom O'Donnell.

We made one reamer of the O'Donnell Willard type in the shop of the Wilson & Willard Manufacturing Company. I do not know what service it gave. I have heard that the reamer went to the American Petroleum Company at Coalinga, and believe that Tom Crumpton said that they had trouble to get it down the casing but they [154] probably could

(Testimony of E. C. Wilson.)

have used it by tying the cutters together, but that they were trying another experiment. I do not know what became of the reamer.

The only changes to Wilson underreamers that I have made was a change in the shape of the block which retains the spring. The first was a rectangular block and served as a bearing for the cutters as well as a bearing for the spring. Was held in position by means of dowel pins. We later changed to a round block which was held in position by a screw or bolt. The next change was to a slotted tee instead of the round tee. At that time we used a double key wedge. We have since changed the shape and proportion of the head of the slotted tee—made it heavier and are now using a different shaped key. The bodies have been made longer in order to enable us to re-machine them.

The object of re-machining is simply to give a multiple use of the body. We have never made a Wilson underreamer having a block of any kind on the retaining bolt or safety-bolt.

The reason for again using the safety-bolt was to overcome the danger of loss of cutters in the event of a broken tee or a lost key. The breakage to the tee to which I refer was in a flaw at the thread.

If one prong or head of the tee-head would break off one cutter would be lost—nothing would hold it.

In mentioning dovetails of the Wilson underreamer I refer to the retaining shoulders or angular bearings on the inner faces of the prongs of the

(Testimony of E. C. Wilson.)

reamer body. They are commonly called "dove-tails."

The only slot in the Wilson underreamer body is a slot which we are now making, but which does not appear in the original drawings at all, and that is for the key which acts as a seat for the spring. The opening through the bottom of this underreamer, such as "Complainant's Exhibit Wilson Underreamer," is clearly expressed when we use the term "Forked Mouth Reamer Body." Willard [155] was the man who told me about the difficulties they had in getting the O'Donnell & Willard reamer down the hole. Willard stated that he could make some changes in that reamer which would make a good reamer out of it yet. Willard stated that they had found from that trial that it could be made a successful reamer by making certain changes. I discussed that with Willard several times. We have always felt that the Wilson reamer was the right design of reamer and it would be useless to attempt to introduce something that did not seem so good. Therefore, we never considered seriously the making or sale of the O'Donnell & Willard reamer.

That portion of the O'Donnell & Willard reamer which I term the "Hollow Slotted Extension" or "Spreading-bearings" for the cutters, is that portion which is interposed between the cutters and which projects downwardly, beginning at the point in the body against which the upper end of the cutters bear when the reamer is in operation. It is the "Verti-

(Testimony of E. C. Wilson.)

cally slotted wedge-shaped projection, 3, extending across the socket, 2." The slot is designated in the O'Donnell & Willard patent as figure 4. Its purpose is to permit the spring-actuated tee or cross-head, 8, to which the cutters, 12, are suspended to travel vertically as the spring, 10, is compressed or extended. There is a hole in the extension also that is drilled vertically extending from its extreme upper end down into the slot, 4. It is this bore, 6, and the slot, 4, which designated that portion of the reamer as the hollow slotted extension. Relatively that same place in the Wilson underreamer is an open space entirely unoccupied and vacant except for the safety-bolt. In order to make that opening the same in the Wilson underreamer as in the O'Donnell and Willard underreamer it would be necessary to cut out those pockets or dovetail ways through the bowl of the O'Donnell and Willard reamer. There is nothing in the O'Donnell and Willard underreamer that shows any dovetail ways as they appear in the Wilson reamer. The cutters of the O'Donnell [156] and Willard reamer do not expand out through the periphery of the body.

The width of shanks of the Wilson underreamer cutters depends on the size of the reamer. The cutter is so proportioned as to give it as much strength through the shank as can be done safely and consistent with the proportioning of the rest of the reamer. The 6" reamer which you have in your office is a correct embodiment of the Wilson underreamer and shows the key as we are now making it. We still use the safety-bolt as shown here. The bearings on

(Testimony of E. C. Wilson.)

the upper ends of the cutters on this reamer you now show me are somewhat worn and the bearings are no longer at right angles as originally made. The wear has a tendency to shorten the shank of the cutter and to change the angularity at the upper end of the cutter. That wear would have nothing whatever to do with the expansion and contraction of the cutters. So far as I can see this reamer is just as when we made it except that wear to which I have referred. A certain amount of wear takes place on all reamers that have cutters slidably mounted and that have spreading-bearings between the cutters. A slotted tee and key makes no change whatever in the mode or manner of expansion or collapsing of the cutters. It requires a different operation to remove or replace the cutters. The Wilson & Willard Manufacturing Company are now manufacturing and offering for sale underreamers like this "Complainant's Exhibit Reamer No. 2."

We substituted the slot, slotted T-rod, and the key, for the reason that the device that we had previously used, namely, the detachable block and threaded screws, would sometimes give trouble by rusting or sticking the thread-screws when used in the water and mud and the reamer, then set aside without being used for some time, would rust and the next time the driller had occasion to use the reamer and to remove the cutters, he would occasionally have difficulty in removing these screws in order [157] to remove the block and T and cutters. We have no

(Testimony of E. C. Wilson.)

such trouble with the slotted T and the stationary key which we use.

Q. 304. Do you consider that this change in any manner affects the mode of operation or principle of the Wilson reamer as exemplified in "Complainants' Exhibit Wilson Reamer?"

A. It does not affect the operation any. It is simply an improvement making the device more convenient than before.

I believe "Wilson Complainant's Exhibit Wilson Reamers" is in condition to use now. The Baker Iron Works continued to manufacture Austrian underreamers until I left there in March, 1904. I do not know how many Austrian underreamers they made. In 1906 to 1909 we had three or four Austrian reamers in Bakersfield Iron Works shop for rent. They had no Double underreamers for rent. I believe we sold and repaired Austrian underreamers for the Columbia Oil Company. I do not remember exactly, but probably I first saw a Double underreamer in 1901 or 1902. It was probably in the year 1903 that I took a wooden model of an underreamer to the office in which Mr. Lyon was employed. My object was to determine what patent rights I could obtain on that device. The cutters of that model were scissor-action and the cutters expanded by striking against the inside bowl at the upper end. When expanded they jumped up onto a spreading bearing on the edge of the bowl of the reamer. This was done by a spring actuated rod. The shanks of the cutters

(Testimony of E. C. Wilson.)

were held within a bowl of the reamer body. I decline to produce the model until the time stated by my counsel.

Certain changes have been made to the model since I first designed it. It is different from the Wilson underreamer we now make. Changes were made prior to manufacturing the first underreamer. The model originally made did not have the V-shaped point on the spreading-bearing. It changed the mode of expansion of the cutters. The first Wilson reamer was made like "Complainant's [158] Exhibit Wilson Reamer" was made in the early part of 1904 or the latter part of 1903. If Dick Smith, present foreman of the Union Tool Company Shop, the complainant in this case, was working in the Baker Iron Works at the time my first reamer was made; probably he worked on it at the time. I knew Arthur Willard in 1903. We discussed underreamers at that time. He always believed the O'Donnell and Willard reamer would do good work. In 1904 I took Arthur Willard to Bakersfield to act as superintendent of the Bakersfield Iron Works. We had no interest in the Bakersfield Iron Works; he was simply an employee of the firm. We had no idea of engaging in the manufacturing business at that time. While I was experimenting with underreamers in 1903-1904 I had frequent conversations with Arthur G. Willard in regard to underreamers and talked over the O'Donnell and Willard reamer with him. I don't believe he made any mention of any particular faults of the O'Donnell and Willard underreamer. I don't

(Testimony of E. C. Wilson.)

remember that he expressed opinion as to why the O'Donnell & Willard reamer had not been continuously used. If he made any statement or remarks that could convey any idea that there were any faults in this underreamer I don't remember it. He did not give me any reason why more of them were not made. I think he has always held to the opinion that that underreamer would do the work. I don't remember that he then expressed the opinion that that underreamer would do the work. I don't remember when he ever so expressed himself to me. I knew in 1903 that they were not doing anything with the O'Donnell & Willard underreamer. I knew that they were not manufacturing them generally,—not making a regular business of manufacturing and selling them. I knew that they were not making them in the shop. Arthur G. Willard and I discussed underreamers a great many times before we went to Bakersfield and exchanged ideas upon them. At that time he was working on an underreamer which had a movable wedge which acted vertically and was [159] spring-actuated and by which movable wedge the cutters were expanded in the reaming position. There was one of these underreamers under construction while I was at the Baker Iron Works. I was informed that it was tried. In a measure it was a success. After Mr. Willard and I went to Bakersfield I don't remember of ever discussing that underreamer. There was nothing of any importance attached to it. Neither he nor I have ever manufactured a reamer of that form since. I think a man by the name of

(Testimony of E. C. Wilson.)

Lehman was using this reamer or tried to use it. That was probably in 1903. That reamer never entered into Mr. Willard's and my plans of formation and exploitation of the business of the defendant.

Q. 483. Did Mr. A. G. Willard tell you how long this last so-called Willard & O'Donnell reamer was actually operated by Mr. Crumpton?

A. He did not.

Q. 484. Did he tell you what the results of such operation were?

A. He may have. At the time that reamer was made and was tried I was still in Bakersfield. I didn't come to Los Angeles very often and didn't get to see Mr. Willard very often. I really don't remember the particulars at all, if he ever told me, as to what result that reamer had given.

I am not positive that I saw Double reamers used prior to 1903.

Q. 495. When did you first see one run into the casing? A. Probably 1901 or '02.

Q. 496. Where?

A. Out in the West Side field. I think I saw some there—what we used to call the old West Side field in Los Angeles.

Q. 497. In the City of Los Angeles?

A. And I think also in Whittier and in Fullerton, probably in 1902 or '03.

Q. 498. You are sure it was not later than 1903?

A. Oh, I have seen them used since 1903; yes, sir.

(Testimony of E. C. Wilson.)

Q. 499. And prior to that time you had seen the Double reamers run into the casing, had you?

A. I think I had prior to 1903, yes, sir.

Q. 500. Are you not positive that you had seen the Double underreamer run into the casing prior to 1903?

A. Yes, sir; I think I have. I am not absolutely positive, but I suppose, from my recollection of my travels through the field, that it was probably 1902—as early as that, anyway.

It was a common complaint that the key device to which Double cutters were suspended was a weak device. I remember Allen Craig complained of it in 1903. He was drilling in Fullerton and complained that tools in use at that time were inadequate to the work really demanded. He even complained of the Rig Irons. Stated that the cutters were too weak to do the work in the required time. I remember Ben Scott of the Columbia Oil Company making the same statement. At that time I showed Allen Craig a drawing of an 8" Wilson reamer on which I was then working and he assured me that the reamer looked very promising to him and that he would give that reamer a trial the first opportunity he had. In his opinion the Wilson Reamer gave promise of being a stronger reamer than any of the reamers then used. I do not remember all the complaints they had to make in regard to underreamers, naturally I would not remember that long. The catalogues I referred to were in the office of the Baker Iron Works. They were the Oil Well Supply

(Testimony of E. C. Wilson.)

Company's catalogues. I did see the reamer being manufactured.

The cutters of the Wilson reamer when collapsed are held together by the U-shape device to hold the cutters collapsed together in order to run the reamer into the casing. This U-device is knocked off as the bits enter the casing. We have had complaints of the Wilson underreamer. We have had the ends of the prongs broken. We have had broken Wilson underreamer cutters and Wilson underreamer cutters lost in the hole. On rare occasions we [161] have had the dovetails on the side of the body broken out. I don't know that I ever saw a Wilson underreamer spread at the bottom. If cutters are not properly tempered they are liable to breakage, although they break very seldom through the tempered portion. Don't remember of ever having lost a whole Wilson reamer in the hole. Never heard of such.

The joint in the middle of the Double underreamer is similar to the joint used in the string of tools. Ordinarily in a string of tools in underreaming there are three or four taper pin and box joints. These joints are the same pin and box joint as used at the upper end of the Wilson reamer and at the top of the sub of the Double reamer, except that with the Double the joint is tubular. The shoulders of the bodies of Wilson underreamer cutters do not contact with the lower end of the dovetails. For the cutters to contact with the lower end of the dovetails endangers breaking the dovetails. From use I have

(Testimony of E. C. Wilson.)

known the shoulders of the cutters of the Wilson reamer to come in contact with the shoulders formed by the ends of the dovetails. It is one of the things we dread with a deadly hate. That is apt to commence trouble at once. As soon as those dovetail shoulders or retaining shoulders or rather the lower ends of same begin to take up any of the thrust of the cutter when in operation, an additional strain is at once given those same dovetail shoulders or retaining shoulders, which is very apt to cause said shoulders to be broken or torn loose from the body of the reamer. The Double underreamer cutters and V-shaped groove now made do not contact at the thrust bearing as formerly. In that thing Mr. Double copied me.

The first reamer we made, namely, the Wilson underreamer No. 1, which was made by the Baker Iron Works, of Los Angeles, did utilize that face or shoulder on the lower ends of the dovetail shoulders or retaining shoulders of the reamer body as a thrust-bearing, the shoulders of the cutters striking against [162] those faces or bearings when the reamer was in operation; but it gave us trouble by causing the dovetails or retaining shoulders to be torn off of the reamer body—at least that was our opinion—and we discontinued the use of that portion of the reamer body as a thrust-bearing.

Q. 583. And the only reason now for using these shoulders on the reamer body is that they are incidental to the cutting away of part of the metal to form the spreading portion of the mandrel of the de-

(Testimony of E. C. Wilson.)

sired width? Is that not true?

A. Yes, sir; they are merely an incidental feature of the construction of the Wilson underreamer, simply being the termination or the lower end of the dovetails or retaining shoulders of the reamer body.

I was repeatedly told by oil operators that the Double cutters did not have sufficient expansion. Allen Craig made that complaint. The "Complainants Exhibit Double underreamer" secures a greater expansion than defendant's underreamer. The "Double underreamer Complainant's Exhibit" was changed after the Wilson reamer came out, to give wider expansion and broader cutters. In 1904 there was an O'Donnell and Willard reamer on the platform of the Baker Iron Works. I probably first saw it in 1900 or 1901. I believe the reamer was for sale. While salesman for the Baker Iron Works I never made any attempt to sell that reamer that I remember of.

I was bookkeeper for the Baker Iron Works from 1897 until 1900 or 1901.

The hollow slotted extension as applied to the slotted portion of the partition between cutters of the O'Donnell & Willard reamer is an old term commonly used. It applies to a class of underreamers utilizing that construction. Such reamers as the Swan are so classified. I term the bottom of the Swan a Hollow Slotted Extension Type. It is hollow and it is also slotted. [163] The hollow and the slot are for the same purpose as in the Double underreamer.

(Testimony of E. C. Wilson.)

If the Wilson underreamer body was counter-bored or enlarged at the upper end it would be impossible to insert the spring. The assembling would be an entirely different method. There is no means provided for such counter-bar in the Wilson underreamer body. The expansion of the Wilson underreamer cutters is brought about by an entirely different set of means than those of the Double reamer. I can fancy such a position or situation which might arise by completely changing the form of construction of one reamer until it would finally look like the other one, and in that case the mode of operation would probably be the same. To change the suspension means, namely, the counter-bore to hold the spring, would not in any wise affect the expansion of the cutters.

If the metal in which is formed the hollow and the slot of the Double underreamer were withdrawn or dispensed with there would be no means of expanding the Double underreamer cutters. The larger portion of that metal is required, to expand and to keep the cutters expanded. I see no slot in the side of the Double underreamer body except that for the Key. That slot is about seven inches long. That stationary wall or partition serves two purposes. In fact, several purposes. Practically all of that hollow slotted extension comes in contact with the backs of the underreamer cutters while in use. The underreamer would not be operative if a portion of that hollow slotted extension were removed. No driller would use it in that condition. The retaining

(Testimony of E. C. Wilson.)

shoulders on the Wilson underreamers are preferably formed by using a milling tool. These shoulders are formed on the inner faces of the forked prongs of the Wilson underreamer. The retaining means on the Double underreamer are formed by planing grooves, a different operation. They are to prevent the cutters from swinging out beyond a certain limit. The Wilson underreamer [164] cutters cannot tilt in the sense that might be applied to the Double underreamer cutters. There being no stock or material interposed between the cutters there is nothing on which they can tilt. They swing or collapse together by a pendulum-like action. The cutters are attached to the tee by means of pockets or recesses in the backs of the cutter shanks. They are somewhat larger than the tee. The cutters do not tilt on that rod, they simply swing on the tee rod. If these pockets or recesses were the same size as the tee it would be impossible for the cutters to collapse. The action with the Wilson cutters is different from that of the Double in that the Wilson cutters do not slide back or forth on the tee or key as they contract or collapse. That is an old form of suspending cutters used long before the Double or Wilson underreamers were adopted. In the old style Wilson there is a pipe over the mandrel and underneath the spring. There is no such pipe on the "Wilson Complainants' Exhibit Wilson underreamer No. 2." The stop was produced by the slot in the tee. We changed to the new style of slotted tee about a year ago, probably the middle of the year 1911. There is approximately

(Testimony of E. C. Wilson.)

450 to 500 reamers like "Complainants' Exhibit Wilson Type," maybe 550.

The O'Donnell & Willard reamer was, according to our records, shipped to Coalinga October 17, 1908. "Defendants' Exhibit Double underreamer" is probably a 4½" reamer. "Complainants' Exhibit Double underreamer" is probably the same size. The new style Double is probably ¼ of an inch wider in cutters. The cutters of the old style Double have been dressed out.

A. 720. Plunging is an action caused by the underreamer cutters wedging or sticking in the hole which is being reamed, and when the upward stroke of the beam takes place a high tension is put on the drilling line and if the reamer suddenly releases or is suddenly freed from the hole the elasticity of the line throws the tools into the air up in the hole a greater distance than the length [165] or stroke of the tools in operation. The next down stroke of the walking-beam begins before the tools themselves start to return on the downward stroke. They thus have a considerably greater velocity on the down stroke than would be given by the swing of the beam and consequently strike into the hole or shell with added force. This causes them in numerous instances to wedge again in the shell, and the operation is repeated.

Q. 721. This same throwing of the bit or tools into the air further than the stroke of the walking-beam is encountered in well drilling when drilling the hole with the ordinary bit, is it not? A. Yes, sir.

(Testimony of E. C. Wilson.)

Q. 722. And the result is the striking of a heavier blow than you would otherwise strike if there were no jump? Is not that true?

A. Yes, sir; that is correct.

Q. 723. Now, do you mean to tell me that there is no plunging in the hole with the Wilson reamer?

A. I have been assured by many practical drillers that the Wilson reamer does not give the trouble from plunging that the Double reamer does.

On extremely small size Wilson underreamers we sometimes flatten the safety bolts to permit the cutters to collapse more completely. The first time that was done was possibly in 1904 or 1905.

I was informed by Edward North one evening that he was designing an improved underreamer, the cutters of which were so arranged or the body was so shaped as to lock the cutters securely, wedging them apart while the reamer was in operation. At that time I was familiar with the difficulty of the original North reamer. I afterwards learned that these reamers were being manufactured by the Union Tool Company. I afterwards learned that the reamers had been tried out but had not been as satisfactory as other reamers then in use. I have not seen either type of North reamer in use in recent years. [166]

At the time I called on Mr. Lyon in regard to obtaining patent on my reamer I received no information as to the Double Reamer. At that time I had seen Double underreamers such as "Defendants' Exhibit" but had never seen one like "Double reamer Complainants' Exhibit." At that time the Wilson

(Testimony of E. C. Wilson.)

underreamer was still in process of experimentation and development.

Q. 749. (By Mr. BLAKESLEE.) Please state in a general way the extent of consideration given by you to improvements in underreamers subsequent to that time and prior to the time you applied for the patent "Defendant's Exhibit Wilson Patent."

Mr. LYON.—Object to that, as irrelevant and immaterial; not redirect examination.

A. My observations up to that time convinced me that there was a very strong probability of my being able to develop an underreamer which would meet the demands, and I was not altogether satisfied with the reamer which is in accordance with the design of the wooden model as shown to Mr. Lyon, and I continued to give the matter pretty careful thought and finally devised changes which to my mind not only strengthened the cutters but gave them even greater expansion, and those ideas in the aggregate were finally crystallized into the one design which later was known as the Wilson underreamer. At that time I was a client of Townsend Brothers, Patent attorneys.

The tee used in the slotted tee type of Wilson underreamer comes in contact with the Wilson cutters.

The second Wilson underreamer was made by the Bakersfield Iron Works during the year of 1904. The third Wilson underreamer was provided with quite a space between the upper edges of the shoulders on the underreamer cutters and the lower

(Testimony of E. C. Wilson.)

end of the dovetails on the reamer body. That has been our practice ever since.

While in the offices of the Baker Iron Works I had frequent occasion to go to the different oil well supply houses and also into the oil fields. I occasionally inspected oil well tools in use in [167] the oil fields. The subject of underreamers was frequently discussed. Much of my time was spent in the shop of the Baker Iron Works. Believe I have not inspected a Double underreamer, never had one taken apart.

The joints in a string of tools are considered hazardous. When the "Double Underreamer Defendants' Exhibit" is in operation there is no point of the body interposed between the cutters below the dovetails. I refer to "Double underreamers Defendant's Exhibit." That is not the case with the "Complainants' Exhibit Double Underreamer." That reamer has a lug or projection interposed between the cutters and extending below the dovetails. The dovetail ways in the Wilson reamer are parallel while those of "Double Underreamer Complainants' Exhibit" or "Defendant's Exhibit" are upwardly and inwardly inclined.

Q. 772. Please state with respect to "Complainants' Exhibit Wilson Underreamer," and also with respect to "Complainants' Exhibit Double Underreamer," the operative relation between the pairs of dovetails or shoulders in each of such exhibits and the co-acting surfaces of the cutters in those exhibits during the play or movement of the cutters between

(Testimony of E. C. Wilson.)

extended and contracted positions.

A. The cutters of the Double underreamers, complainants' exhibit, being held in place by inwardly and upwardly inclined retaining shoulders on the reamer body, have a tendency to tilt or teeter on the hollow slotted extension or spreading-bearing on their downward travel preparatory to collapsing the cutters. This, for the reason that the pressure of the casing-shoe against the cutters themselves have a tendency to collapse the cutters and apply a strain to that end from the moment the cutters come in contact with the shoe when withdrawing the reamer into the casing. This causes the upper ends of the cutters to tend to tilt outwardly and the lower ends of the cutters to tilt inwardly. No; I am wrong. No; that is right. The lower end of the cutters tilt inwardly and the upper ends tilt outwardly. And this continues until [168] the cutters are drawn down far enough for them to drop in together as the inwardly projecting shoulders at the backs of the cutters slip off over the spreading-end of the hollow slotted extension. This operation differs from that of the Wilson underreamer, in that the dovetails or retaining shoulders of the Wilson underreamer body, being parallel to each other, and also parallel to the reamer body, does not give the cutters an opportunity to tilt outward at the upper ends; nor is it necessary for the cutters to tilt outwardly at the upper ends, as they are being collapsed, for the reason that there is no material interposed between the shanks of the cutters to prevent them from col-

(Testimony of E. C. Wilson.)

lapsing or swinging toward each other, as is the case with the Double underreamer. Consequently, the cutters of the Wilson underreamer simply swing on the T-bar, allowing the lower ends to swing toward each other as the reamer is collapsed. Such cannot be done with the cutters of the Double underreamer, as there is no opportunity for them to swing toward each other so long as there is solid steel interposed between the shanks of the two cutters, without the allowance made for same, and that allowance could only be made by removing that hollow slotted extension from between the cutters. There being no possibility of the Double underreamer cutters swinging together, an allowance must be made in order to permit them to tilt, by allowing the upper ends of the shanks to tilt outwardly to permit collapsing. Hence, the tapering dovetails or retaining shoulders, which is not needed on the Wilson underreamer body. In brief, the Double underreamer cutters literally tilt over the spreading-bearing as they are being drawn down into collapsing position, while the cutters of the Wilson underreamer do not tilt, as the upper ends remain in the same relation to each other and the lower ends only of the cutters change relation to each other by swinging toward each other as the cutters collapse.

Q. 773. Please state whether I am to understand, in the collapsing [169] movement of the cutters in "Complainants' Exhibit Double underreamer," there is a relative movement between parts of the cutters at the upper end, or whether there is a rela-

(Testimony of E. C. Wilson.)

tive movement between the upper ends of the cutters in entirety.

Mr. LYON.—Objected to as leading.

A. The entire upper ends of the shanks of the Double underreamer cutters tilt outwardly for a certain period of time in which the cutters are being collapsed.

Q. 774. (By Mr. BLAKESLEE.) Please specify in a similar respect with relation to the upper ends of the cutters in “Complainants’ Exhibit Wilson Underreamer.”

A. Only that portion of the upper ends of the shanks of the cutters of the Wilson underreamer which are above the T-head has a tendency to tilt outwardly as the cutters collapse, as the pivotal point is at the point of suspension of the cutter on the T-head.

Q. 775. In either of these underreamers, is there a slight movement of the cutter upon the key or upon the T-head, as the case may be?

Mr. LYON.—Objected to as leading.

A. In case of the Double underreamer, the cutters are obliged to slide outwardly on the key as they are withdrawn into collapsing position, for the reason that the shanks of the cutters are tilting away from each other and outwardly as the cutters are being collapsed; but in the case of the Wilson underreamer, they do not slide on the T-head, as the pivotal point is directly at the point of suspension on the T-head itself.

Q. 776. (By Mr. BLAKESLEE.) Please com-

(Testimony of E. C. Wilson.)

pare the collapsing action of the cutters in each of these underreamers with respect to the responsiveness and opposition to the stresses applied to same in the collapsing action.

A. I will explain that I have discovered that there is a slight tendency for the Double underreamers to commence collapsing [170] on their initial downward stroke, and this is brought about by the tapering bearings of the dovetail shoulders or retaining shoulders of the reamer body. The collapsing is due to the tilting action of the cutter on its spreading-bearing; but the action is produced in a different manner with the Wilson underreamer. The Wilson underreamer does not rock on the spreading-bearing. The cutting edges of the cutters swing inwardly, as they tend to follow the tapered spreading-bearings at the lower extension of the reamer body.

Q. 777. Please go further and compare these two collapsing actions with respect to responsiveness to the pressures applied in causing the collapsing.

A. In the case of the Wilson underreamer, the points of expansion are interposed well down toward the lower or cutting ends of the reamer cutters. There is no material in the reamer body which comes in contact with the backs of the shanks of the cutters and consequently there is not the chance for these cutters to bind or cramp when the strains applied by the shoe are collapsing the cutters as the reamer is being withdrawn into the casing that does occur on the Double underreamer. The retaining shoulders of the Double underreamer are formed in a

(Testimony of E. C. Wilson.)

different manner from those of the Wilson, namely, they are formed by planing or machining grooves in the sides of the pockets or sockets formed to receive the shanks of the cutters. As the dovetails or shoulders on the shanks of the cutters work vertically in these grooves, it will be plain that there is a pressure applied at both front and back of the retaining shoulders or dovetail shoulders on the shanks of the cutters and which causes more or less of a bind or cramping as the collapsing force of the shoe is applied to the cutters when withdrawing the cutters into collapsing position; consequently the Wilson underreamer cutters collapse more freely and the reamer withdraws into the shoe with less strain and with less binding than is the case with the Double underreamer. [171]

Recalled—Redirect examination resumed.

(By Mr. BLAKESLEE.)

Q. 778. In the Swan underreamer, to which you have referred in your cross-examination, I believe you have testified there was present a hollow slotted extension. Will you please compare that hollow slotted extension with what you have referred to as the hollow slotted extension in "Complainants' Exhibit Double Underreamer," and "Defendant's Exhibit Double Underreamer?"

A. The hollow slotted extension of the Swan underreamer had a hole drilled in it, centrally located, and extending lengthwise with the extension, and said hole was drilled to admit of the spring-actuated rod or mandrel. It had a slot extending through the

(Testimony of E. C. Wilson.)

extension from one side to the opposite side of the extension, and the slot also extended through the hole drilled in the extension. Mechanically speaking, it was hollow by reason of the hole being drilled in it lengthwise, and was slotted by reason of the slot projecting through from one side to the other of the extension. The extension as a whole refers to that portion of the underreamer body which extends downwardly and beginning with the abutments or shoulders against which the cutters thrust when reamer is in operation and when cutters are expanded or in reaming position. It had dovetails or retaining shoulders at each side of the extension, which shoulders were formed by machining grooves into the sides of the reamer body parallel to the faces of the extension. These grooves formed ways for the retaining shoulders or dovetail shoulders on the cutters, and by means of those grooves the cutters were held in place. The hollow slotted extension formed the means of expanding the cutters to reaming position and holding them to reaming position, but it did not have means provided at the lower end in the way of tapering faces for expanding the cutters into position, as the cutters of the Swan underreamer contracted or expanded by traveling vertically on the inclined faces of the hollow [172] slotted extension, the said faces projecting downwardly and inwardly. The hollow slotted extensions of the Double underreamer, in both the exhibits of the complainants and the exhibit of the defendant have precisely the same form of hole drilled lengthwise with the

(Testimony of E. C. Wilson.)

extension centrally located therein, has the same form of construction of slot and similarly located, the retaining shoulders or dovetails on the body are formed in the same manner, namely, by planing or machining grooves to admit of the retaining shoulders on the cutters; but the difference or differences between the hollow slotted extensions of the Swan reamer and the Double reamer is that the opposite faces of the hollow slotted extension of the Double are parallel and vertical, and also have a wedge-like face or termination of the lower end of the hollow slotted extension formed by downwardly and inwardly projecting faces, over which faces the cutters slide when being collapsed or expanded.

Q. 779. Please compare and contrast the features of "Complainants' Exhibit Willard & O'Donnell Reamer" with the features which cause the spreading of the cutters in the Swan reamer.

A. As before explained, the spreading features of the Swan are simply a wedge-shaped partition or hollow slotted extension interposed between the two cutters. The body is provided with retaining shoulders or dovetail shoulders by which the cutters are held in place, and the cutters are collapsed by drawing them downward, which compresses the spring, and as they follow the downwardly and inwardly inclined faces of the hollow slotted extension, the cutters are brought closer together, or, in other words, collapsed. They are expanded by the opposite action of the spring, drawing the cutters upwardly and outwardly. The expanding means of the O'Donnell &

(Testimony of E. C. Wilson.)

Willard underreamer consisted of a similar hollow slotted extension or stationary wall or partition, with the cutters slidably mounted, and as the cutters were drawn downwardly, upon reaching a certain point they tilted over the extreme lower end of the hollow slotted extension or stationary wall or partition [173] interposed between the cutters, the lower ends tilting inwardly and the upper ends of the cutters tilting outwardly and sliding upon the key or suspension means. They were expanded in position by the opposite action of the spring, which withdraws the cutters upwardly, causing the cutters to again tilt outwardly over the spreading-bearing of the slotted extension, the upper ends of the cutters tilting inwardly at the same time, and the cutters were drawn upwardly until they rested against the thrust-bearings and expanded to reaming position. The main difference was that the cutters of the Swan underreamer had no tilting action; those of the O'Donnell & Willard tilted over the spreading-bearings interposed between the cutters.

(By Mr. BLAKESLEE.)

Q. 782. Supposing the slotted extension in each of these Double exhibits and types of reamers were eliminated, please state what the effect would be with respect to the action of the cutters and the slotted rod and the key suspending the cutters.

A. If the portion of the hollow slotted extension of Double underreamer defendant's exhibit—that portion of the hollow slotted extension which is in-

(Testimony of E. C. Wilson.)

terposed between the backs of the cutters—was removed entirely, the underreamer would be rendered entirely inoperative. There would be nothing left between the cutters over which they could tilt or by which they would be expanded into reaming position, nor would there be any material interposed between the cutters which would keep the cutters expended to reaming position. Consequently they would simply hang together upon the key and the vertical travel of the cutters up or down would neither expand nor contract them; consequently it would be utterly impossible to do any reaming whatever with the tool; the reamer would simply swing up and down in the hole, with no possibility of the cutters swinging out or being held out into reaming position. In the case of “Complainants’ Exhibit Double Underreamer,” [174] the result would be different. This reamer has been so changed that if that portion of the hollow slotted extension which forms the wall or partition between the backs of the cutters were removed, namely, the same stock correspondingly as could be removed from the old style Double underreamer as shown by defendant’s exhibit, the reamer might be worked with some degree of success. The changes have been so pronounced that the operation referred to would still leave spreading-bearings interposed between the cutters, which spreading-bearings would be immediately below the dovetail shoulders or retaining shoulders of the reamer body. The cutters of the improved Double underreamer, as shown by the complainants’

(Testimony of E. C. Wilson.)

exhibit, have also been changed by both broadening the body of the cutter and narrowing the shanks of the cutter in such a way as to leave the shoulders projecting at right angles to the shanks, which shoulders would ride upon that portion of the spreading-bearings of the improved Double underreamer which would remain after removing the material from the hollow slotted extension which is interposed between the shanks of the cutters. However, this reamer would probably prove to be very dangerous, as the only means of keeping the cutters spread apart at the upper ends when the reamer would be in operation would be simply the light rod, with slot and key, by which the cutters are suspended.

Q. 783. What would be the working relation, under the conditions last specified, between the cutters and the slotted springs around its stem or rod?

A. The rod would be the only bearing against which the cutters could strike at the upper ends when tilting inwardly while in reaming operation, and the rod would have to serve as the spreading-means between the cutters at the upper end.

The dovetails or retaining means on the shoulders on the Wilson underreamer body are much heavier and consequently much stronger than those of the Double underreamers of the same size. [175]

My source of information in regard to the explosion at the Red Top Hill Oil Company when endeavoring to blow or shoot a piece of broken Double underreamer out of the way was from the papers. That

(Testimony of E. C. Wilson.)

article was published in the "Echo" and the "Daily Californian," both of Bakersfield. It also appeared in the Coalinga paper. [176]

Testimony of John A. Kibele, for Defendant.

JOHN A. KIBELE deposes and testifies as follows:

My name is J. A. Kibele; age, 37; residence, Bakersfield, California; occupation, drilling wells. Have drilled oil wells for about eighteen years. Have operated in Ohio, Indiana and California. Have been in California about twelve years. I have used underreamers extensively. I have used Austrian, Double and Wilson underreamers. I used the first Austrian reamer in 1900. In Santa Barbara County. We did not make so very much of a success with it. We had no calf wheels in the derrick and we tried to underreamer before we raised the pipe, that of course made it difficult to start the reamer. I had seen Austrian underreamers before that time and had seen them in different supply houses.

My first knowledge of the calf wheel was about the year 1900. That was in the Kern River Field. The calf wheel is absolutely necessary in order to use an underreamer.

Q. 21. Please state how this concerned the operation of underreaming.

A. Well, if you didn't have the calf wheel in a derrick, you would either have to take your lines off of the bull wheel and set your tools back to raise and lower your pipe, and it is necessary to have the pipe

(Testimony of John A. Kibele.)

up some distance off of the bottom to start an underreamer or some distance off of the bottom to start an underreamer or some distance away from the shoulder.

Q. 22. What effect did the introduction of the calf wheel for handling the casing have upon the operation and practice of underreaming?

A. Well, if you didn't have the calf wheel in the derrick, you might as well throw the underreamers away, or else make yourself twice as much work.

Q. 23. Please recite your experience in the use of calf wheel with an underreamer, at the same time that an underreamer was used. [177]

A. I don't quite understand your question.

Q. 24. Please tell us about the first experience you had in underreaming when a calf wheel was used to support the casing.

A. Well, you first must raise the casing from the bottom of your shoulders to start an underreamer.

Q. 25. Let me interrupt to call your attention to the fact that I wish you to state what your first experience was of this sort, that is, what your first personal experience was of this sort.

A. With the use of an underreamer and the calf wheel?

Q. 26. Exactly.

A. Well, of course my experience since with the calf wheels and the underreamers has been successful, that is, I have got along all right, and if it was not for the calf wheels, I could not hardly see how

(Testimony of John A. Kibele.)

you could use an underreamer, that is, in success, because the casing must be from the bottom of the hole to start a reamer. You could not start a reamer, you might say, with the casing standing on a shoulder if the formation was hard enough to hold up the weight of the reamer. That is as near as I could state it.

Q. 27. When was your first experience of this sort?

A. Well, that was along about 1901 or 1902. Some time like that. About 1902, I think. It might have been a little later than that.

I used Double underreamers in about 1902. I used style like Defendant's Exhibit Double underreamer. We used it with a calf wheel. Never saw a Double underreamer used without a calf wheel.

I first used the Wilson underreamer in about 1907. Of the style Wilson underreamer Complainant's Exhibit Wilson Underreamer.

I have used both styles of Double underreamer. The first underreamer, Complainant's Exhibit Underreamer, was about three [178] and one-half years ago.

I prefer the Wilson underreamer. The Wilson underreamer goes down the casing better and it pulls into the casing easier and is stronger in general. It gives you more for your money. It can be re-machined and used three different times. After the Wilson Reamer has been re-machined it is just the same in operation as before. I have various sizes of Wilson reamers on hand now which I use myself and which I rent. At the present time I think there

(Testimony of John A. Kibele.)

are more Wilson reamers used in the Kern River Field than the Double. In other fields I think they are in use in about equal number. That has been since the last three or four years. I have observed more broken Double underreamer cutters. The Double reamer cutter breaks through the hole where the key is placed. I suppose I have seen three Double underreamer cutters where I have seen one Wilson.

The old style Double underreamers give us trouble in getting into the holes. We had to tie the cutters together. The new style Double reamer, being a brand new reamer did not give me trouble at that time. I have never found it necessary to tie Wilson cutters together to get them down into the hole. The only breakage to Wilson underreamers that I have ever had was broken cutters. Have seen Double underreamers broken at the bottom. I have seen about a carload of broken Double underreamers in Coalinga. I have known of Double underreamers giving trouble at the middle joint. Same occurred on the Peerless Oil Company's property in the Kern River Field. The reamer came unscrewed at that joint. They fished the broken part out. The Wilson cutters have more cutting surface than the Double cutters. This is an advantage as it gives more cutting surface and you can ream the hole in a little less time. I have known of "key-waying" the hole being done with both styles of reamers. [179]

I have used Wilson reamers without the retaining bolt or safety bolt. It made no difference whatever. If there is enough room in the hole for the cutters

(Testimony of John A. Kibele.)

to swing across from one side to the other with the safety bolt out there is no occasion for running an underreamer as the hole is large enough without reaming. I cannot figure out how a man could pull the cutters to one side while the reamer is down in the hole. The wider cutters of the Double reamer were first used about four and one-half years ago. It was between 1908 or 1909 I first saw Double underreamers having the wide shoulders.

The middle joint in the Double underreamer creates the risk of running one more joint in the hole. Each joint used on a string of tools increases the risk.

Q. 119. Please compare and contrast this joint between the mandrel and the sub of the Double underreamer with the joints that are used in other parts of the string of tools used in reaming.

A. Well, I would compare the joint on the Double reamer like a joint that is used for rotary drilling, a hollow joint; and the other is a tool joint that is used on the drilling tools.

Q. 121. In the use of the Wilson underreamer, have you ever had it "ball up" between the cutters?

A. No, sir; I have not.

Q. 122. How about your use of the Double underreamer in this respect?

A. No, sir; I have not.

Q. 123. Assuming that you were reaming in a formation where such balling up was likely to occur, please specify which of these types of underreamers you would prefer to use.

(Testimony of John A. Kibele.)

A. Well, I would prefer the Wilson reamer.

[180]

Q. 124. And for what reason?

A. Well, because I have never, in my experience in using the reamer, had any occasion to change the wrist-pin on the crank, to shorten the stroke of the lick. I have always felt confident that the reamer was equal to any work that it was intended for.

Q. 125. How as to the use of the Double under-reamer and the position of the wrist-pin?

A. Well, if I was compelled to run the old reamer in hard formation, I don't know as I would run it as hard as I would the Wilson reamer.

Q. 126. In other words, you would move the wrist-pin so as to get a shorter stroke?

Mr. LYON.—Objected to as leading.

A. If I was given one of the old reamers to run and it was left to my judgment, I would set the pin back to where I thought it was proper.

Q. 127. (By Mr. BLAKESLEE.) What do you mean by setting the pin back?

A. Well, to avoid breaking the reamer in the hole.

The underreamer is the quickest and easiest way of disposing of pieces of broken casing in the hole. I have used Wilson underreamers with very good results on such jobs. We got by the casing. The Wilson reamer worked first class on that kind of work. Never had any trouble with it. Never knew of any instance where Wilson reamers or Double reamers ever had caused trouble by material being jammed in between the cutters.

(Testimony of John A. Kibele.)

The Traders Oil Company of Coalinga lost a Double underreamer in the hole and had to move the rig. That is, they had to start a new hole. A reamer was left in the hole by another company the same way at about the same time. That was a Double [181] reamer. On the Angeles property the Double reamer broke in two at the square portion of the middle joint. The lower half of that reamer was never fished out.

Another instance, on the Lucile property in Coalinga the Double underreamer cutter broke and they could not get the reamer out without first pulling twenty-two hundred (2200) feet of eight-inch casing. They used a Wilson underreamer after that. I have probably seen a big wagonload of the lower halves of Double underreamer bodies in junk heaps or scrap heaps of the Coalinga fields. The old bodies were what we termed "jimmed up." By that I mean broken or battered and worn out. There were also broken cutters of Double underreamers there.

Q. 191. What did you observe there as to any of these reamers? What did you see there?

A. At this old junk pile?

Q. 192. Yes.

A. Well, some were broken out and some were doubled back, and in all sorts of conditions. The reason I went there was I was going to buy a string of underreamers; and in the first place I went there to rent them and the man in charge told me that they had gone out of the rental business, and he told me— We went out to see if there was one of the

(Testimony of John A. Kibele.)

reamers in condition to run, and there was not. So, after looking over this bunch of reamers, I concluded that I would buy the Wilson reamer. That was the best evidence that I could get in the difference of the two reamers. And then when I was through with my own personal work, I put my reamers on the market for rental, and I took their rental list price; I copied that from the Oil Well Supply at Coalinga.

The broken Double cutters were broken where the key goes through the cutter. [182]

The Wilson underreamer has more expansion, cuts a larger hole than the Double reamer.

Cross-examination.

The calf wheel is used in an oil-well rig to lower and raise the casing. In order to underream the casing is raised on the calf wheel and then is held in suspension by spider or casing spider which has been clamped. If you did not have the calf wheel it would be necessary to handle the casing with a bull wheel, but you would have to take the drilling cable off and string up the line which handles the casing and this would take a great deal of time and also you would probably not have enough power with the bull wheels to handle the casing.

Q. 204. And you can raise the casing with the bull wheels, can you not?

A. You can, but it would be impracticable, for the reason that there is times you have to raise and move your casing every thirty minutes, and sometimes in less time than that.

(Testimony of John A. Kibele.)

Q. 205. In underreaming?

A. In underreaming, or in carrying a string of casing.

If you don't have a calf wheel in the derrick I don't think it would be possible to underream. The underreamer would not be of use to you. If you dispense with one you might as well dispense with both.

When drilling an oil well in Indiana we used Standard Rigs but did not have calf wheels. We handled the drilling tools with the bull wheels. The casing was put in with a single line with the end of the bull wheel.

Underreamer cutters are generally dressed by the tool dressers or helpers in the rig. I prefer to run an underreamer on the long stroke as they cut the hole better. The reamer is not so apt to mud up.
[183]

I mean by fishing when endeavoring to recover a lost tool in the hole.

There are instances where men get careless with joints and even drilling bits are lost in the hole. Breakage of drilling tools in drilling oil wells is not altogether a frequent occurrence. Breakages are not altogether due to carelessness of the men. Sometimes the tools break at the well, which is no fault of the driller. Of course where the joint occurs there is a risk. In regard to the expansion of the Wilson cutters will say that I remember Sam Lamb while working on the St. Francis oil property in Coalinga had difficulty in carrying special four and

(Testimony of John A. Kibele.)

half inch ($4\frac{1}{2}$ ") casing. He was using Double reamers. I persuaded him to try Wilson reamers and the Wilson reamer did the work without any more trouble, making the right sized hole.

The first Double reamer I ever saw was in the year 1906. I have been associated with a company for about seven years who use Double reamers. In 1901 I was drilling in Schuman Cañon. That was where I used the Austrian underreamer. In parts of the Kern River fields there is considerable underreaming to be done. In 1901, 2, 3 and 4 I cannot say that I saw any Double underreamers in the field, although I was in the Kern River field, Santa Barbara county fields and the Santa Maria fields. I can't say that I did not see them, I don't remember. As a matter of fact, I do not know whether Double reamers were used in 1902, 3 and 4 or not.

At the time I first saw the Wilson underreamer the Double underreamer was in general use. I cannot tell how many Wilson or Double reamers have been in use at any one time in the Midway fields. I know this however, that in one rig you may find Wilson reamers and in the next rig you will find Double reamers. Sometimes you will find Wilson and Double reamers in the same derrick. For the deeper hole and the smaller holes the Wilson [184] reamer seems to be the one preferred.

I have sold a good many Wilson underreamers. It has been about four years since I sold Wilson underreamers. I have recommended Wilson underreamers ever since. My reason for abandoning sell-

(Testimony of John A. Kibele.)

ing Wilson underreamers was that I sold so many of them that the shop (Bakersfield Iron Works) was put on a night and day basis and they couldn't fill the orders that I got. Wilson will verify that statement. I don't know how many I sold—probably more than a hundred. I think a Wilson underreamer will outlast three Double reamers. I believe at the time I was selling Wilson reamers I sold more in the Coalinga field than there were Double reamers sold. California drilling necessitates moving the casing while drilling operation is in progress. This to keep the casing from freezing, and also while underreaming. Hence the necessity for the calf wheel. The first time I ever saw calf wheels in use in California was about 1901.

Q. 344. What would you say was the proportion of Wilson and Double underreamers in use in California at the present time?

A. About probably three to one, I suppose, take it as a general thing through.

Q. 345. (By Mr. BLAKESLEE.) You had better state in favor of which.

A. Well, I presume that there is maybe three Double reamers sold to the Wilson's one.

Q. 346. (By Mr. LYON.) That is as nearly as you can estimate it?

A. That is as nearly as I can estimate it.

Q. 347. And that is based upon your observation of the fields?

A. Well, I think so. That is probably the record. But as for the difference of the tools in use, I sup-

(Testimony of John A. Kibele.)

pose it is about [185] equal, that is, in the drilling operations. I think the Wilson reamer will outlast three Double reamers.

Q. 348. That is due to the re-machining that you speak of? A. Yes.

Q. 349. And that re-machining is practically making a new reamer out of the reamer after it has been worn out in its original condition? A. Yes, sir.

I have been going through the oil fields every two or three weeks.

A. 390. Well, yes, sir. In order to underream a hole successfully, you have to naturally have a free string of casing; you must raise your pipe and give yourself clearance for the underreamer to start; and when you underream the hole down to the point you have drilled, you can lower the casing as near to where to keep the sand from bothering you to keep you from going on ahead, but you have to move the casing as the reaming progresses. Well, while you are making twenty feet of hole, you are probably moving the casing four or five times, and probably while you are underreaming you can probably underream maybe two screws without pulling out and you move the casing maybe once while you are underreaming twenty feet.

Q. 392. With respect to the general operation of making a hole in the California fields, what do you consider has been of the most benefit to such operation during the last twelve years?

A. Well, with the aid of the calf wheels and the underreamers.

(Testimony of John A. Kibele.)

A. 399. We had a calf wheel on the rig at Schuman Canyon. I put that in, in a kind of makeshift way, myself.

Q. 400. How long did you have the calf wheels in the Schuman Canyon, then?

A. Well, it was after the hole was down about eight or ten [186] hundred feet. We didn't use them very much then, because we didn't hardly know enough about it then.

**Testimony of E. Clement Wilson, for Defendant
(Recalled).**

E. CLEMENT WILSON — Recross-examination
Continued.

The first Wilson underreamer, namely, Wilson Reamer No. 1, was first used by the California Oil-fields Limited of Coalinga. It was then used in McKittrick by the Associated Oil Company. It then went to the Salt Lake Oil Company of Los Angeles.

Q. 805. The dovetail ways and slips of this Swan underreamer provide a mode of collapsion and expansion which is controlled and dependent upon the inter-engaging dovetails forming a track or guide for the bits, and causing the bits to move by sliding in straight lines upon the lower end of the body or mandrel of the underreamer. Is that not correct?

A. Yes, sir; the cutters travel in straight lines at diverging angles from each other.

Q. 806. In other words, the bits of this Swan underreamer or of the device as shown in the said Swan patent, do not in any manner tilt freely upon

(Testimony of E. Clement Wilson.)

the head of a spring-actuated rod, do they?

A. They do not.

Q. 807. Would you say that that is the same mode of operation as the mode of operation utilized in the expansion of the bits in the Double underreamer?

A. Not altogether. The mode of expansion in the Double underreamer is a combination of the mode used by the Leidecker Tool Company's reamer, commonly known as the Swan reamer, and the tilting action of the cutters on this spreading-bearing as exemplified by other reamers.

Q. 808. What reamers?

A. The O'Donnell & Willard underreamer and the underreamer shown by Brown's patent No. 867,296, the underreamer shown by figure 2161 in the Oil Well Supply Company's catalog under date of the [187] year 1900, and also by the underreamer shown in Day's patent, the number of which is 403,877.

Testimony of W. W. Wilson, for Defendant.

W. W. WILSON deposes and testifies as follows:

My name is William W. Wilson. Age, 31 years. I reside in Los Angeles. Occupation, designing and selling oil well tools. I have been in this line of work about eleven years. I was employed by the Bakersfield Iron Works as draftsman, also outside draftsman for outside parties in 1903 to 1908. Graduated from Stanford University, engineering department. Have been employed by the Columbia

(Testimony of W. W. Wilson.)

Oil Company of Bakersfield and was connected with the Wilson and Willard Manufacturing Company since 1908, with the exception of eight months in 1910 when I was connected with the Bunting Iron Works of Coalinga. Have previously acted and testified as expert in patent litigation cases.

Q. 12. Please summarize, briefly, the disclosure of the drawing and specification of said patent.

A. We have disclosed in this patent an oil-well tool known as an underreamer, which is intended to be run in a hole which has been previously drilled to a considerable distance beyond the end of the casing by means of a bit, and which hole is intended to be enlarged sufficiently to allow the pipe to follow down the hole. In many formations the weight of the casing on the casing-shoe or sharpened collar on the bottom of the casing is sufficient to cut the sides of the hole out large enough to allow the casing to follow. In other formations it is necessary, due to their hardness, to use a tool which will run down inside the casing and have means which will expand sufficiently to ream the hole out to a diameter larger than the outside diameter of the collars on the pipe to allow the casing to be lowered further in the hole. Such [188] a tool is called an underreamer. This reamer disclosed in patent 734,833 consists of a body in which there are two pieces joined together by threaded parts in which there is a spring seated at its lower end on a shoulder in the body. The upper end bears against a nut or retaining means of a mandrel or rod. The lower end of this rod has a

(Testimony of W. W. Wilson.)

slot through which is inserted a key, which key is long enough to extend within pockets cut on the insides of the cutter-faces. On the lower end of the body are pockets cut in the sides, into which the cutters or expanding-means are placed. The cutters are arranged to have movement so as to be drawn down over the ends of the body, and means are arranged permitting the cutters to close together when in this position. When released the cutters are drawn up by the pressure of the spring acting on the rod, which in turn acts on the key, which acts on the cutters, drawing them up on the body over spreading-bearings on the lower end of the body, causing them to expand to a sufficient diameter that they may be used to bore or ream the hole out to the enlarged diameter. The lower end of the body, which extends beyond the upper end of the cutters when in expanded position, is shown in section figure VII, consists of a substantially H-shaped section. This section has a whole drilled vertically through it into the rod or mandrel place. It also has a slot cut crosswise, through which the key which supports the cutters passes. This slot is made sufficiently long to allow necessary travel of the key, to allow the cutters to be withdrawn or to be drawn into acting position. On the inside of the cutters are placed one shoulder on each cutter, shown in figure XII by face 18. These faces are arranged to bear against the lower portion of the extension shown in figure IX at 6, when the cutters are in working position, and are the means whereby

(Testimony of W. W. Wilson.)

these cutters are held in expanded position. In order to operate the reamer, the screw eye, 28, is screwed into the lower end of the mandrel rod, and means are used on this screw-eye to draw the rod down, compressing the spring, drawing the cutters down so they may [189] be collapsed. The reamer is then placed in the pipe and run down to the lower end of the casing, the cutters being held in contracted position by the pressure of the pipe on the outsides of the cutters, holding the face 26 on the cutters in contact with the lower face 25 of the extension. As soon as the reamer moves beyond the casing-shoe or bottom of the casing, the pressure on the outsides of the cutters is relieved, allowing the spring to slip the faces 26 of the cutters off of the face 25 of the extension, thus expanding them until faces 18 are expanded sufficiently to pass up over the extension 6 of the body when the cutters are drawn up with their upper ends bearing against faces 8 of the body, the reamers in working position. It is now connected to the walking-beam in the rig and giving the customary vertical motion usually about two to three feet, used in the process of drilling. This is continued until the hole is reamed sufficiently, when it is withdrawn from the hole, the cutters striking the under edge of the casing-shoe, causing them to remain stationary for a short time, allowing the body to be withdrawn from between them sufficiently for the cutters to collapse, when they follow with the reamer-body out of the hole.

(Testimony of W. W. Wilson.)

Q. 13. Please briefly compare and contrast the features of construction and interrelation of parts of "Defendants' Exhibit Double Underreamer" with the construction and interrelation of parts disclosed in "Complainants' Exhibit Double Patent."

A. The "Defendants' Exhibit Double Underreamer" is the same as shown in "Complainants' Exhibit Double Patent," except that, on the cutters there is an added dovetail or ridge, intended to co-act with the body, or, rather with the extension of the body, which dovetail is placed parallel with and at the lower end of the main dovetails on the cutters shown in the patent figure at 29. The slot or pocket 16 shown in figure XII at 16 is changed in the "Defendant's Exhibit Double Underreamer" to extend clear through the cutter at this point. There is added in the "Defendant's Exhibit [190] Double Underreamer" at this point a small hole, in which there can be placed a pin extending across the opening to prevent possible loss of the key, or, also, to prevent its displacement. The face shown in figure XI of the patent above face 26 does not extend to the top of the cutter, but extends within about an inch thereof, where another face is added which is in line with the lower bearing-face shown at 18 in the patent. This upper face is intended to take the strain of the cutters inwardly at this point. In the body shown in "Defendant's Exhibit Double Underreamer," there are added dovetail spaces or notches cut in the lower end of the extension at the sides of the cutter-ways, intended to coact with the

(Testimony of W. W. Wilson.)

extra dovetails described on the cutters when the cutters are in acting position. The lower end of the partition between the cutters shown at 25 in figure IX consists of two angular faces in "Defendant's Exhibit Double Underreamer" instead of being rounded as shown in the patent drawing. These, however, have become worn and more or less rounded.

Q. 14. Have you examined "Complainants' Exhibit Wilson Underreamer" and "Complainants' Exhibit Wilson Underreamer No. 2"?

A. Yes; I have examined both reamers and am familiar therewith.

Q. 15. Please compare and contrast the construction and interrelation of parts and features of these two exhibits with the construction and interrelation of parts and features disclosed in "Complainants' Exhibit Double Patent," following up the comparison, and the like, as directed at structure, with a statement as to similarities and dissimilarities as between said reamer exhibits and said patent exhibit, pertaining to mode of operation and the nature of service, and performance of each.

A. The body shown in the Wilson exhibits consists of a single piece of steel, furnished with means at its upper end for attachment to a string of tools, and on its lower end arranged to receive the cutters; also with a cavity to receive cutter-operating means. The [191] Double patent describes a body made of steel, furnished at its upper ends with means for attachment to the string of tools, said

(Testimony of W. W. Wilson.)

body consisting of two parts, which screw together to allow access to the bore containing the spring and mandrel rod, whereas access to this spring in the Wilson reamer is had through the bottom opening of the bore in the Wilson body extending out below. In connection with the threaded joint in the center of the Double body described in the patent, there is a square or flattened place on the lower piece of the body for the application of a wrench thereto. No such means are necessary in the Wilson body. The lower extension of the Double body consists of the H or I-shaped section shown in figure VII. The main section of this extension forms a partition or spacing-member which lies between the cutter shanks when the cutters are extended or expanded. The Wilson body consists, or has an expansion consisting of two forks or prongs, which are placed at the sides of the cutter-shanks when the cutters are in expanded position. In the Double patent, figure VII, there are grooves provided, shown at 9. These grooves are formed in the sides of the spaces provided for the cutters as shown. In the Wilson reamer these means are replaced by ribs, or shoulders, on the insides of the prongs. In the Double patent, the extension is provided with a hole sufficiently large to allow the mandrel to pass through. This hole is drilled the full length of the extension and extended into the spring bore or hole of the body. Also, the extension is provided with a slot, allowing room for the passage of the key which passes through the mandrel. This slot is long

(Testimony of W. W. Wilson.)

enough to allow sufficient play for the key in operating the cutters. No such means are provided in the Wilson underreamer. In the Double underreamer, shown in the patent, the expansion of the cutters is caused by contact of suitable faces on the cutters with the main body of a wall or partition of the extension shown at 6. In order to allow the cutters to collapse over [192] this extension, pockets are cut in the backs of the cutters, these notches being on the shank or upper extension of the cutter. No such means are necessary in the Wilson reamer. The expansion of the Wilson cutters is accomplished by faces arranged on the ends of the forks or prongs. When the Double underreamer cutters are in collapsed position, there is interposed between them the key, the lower end of the mandrel-rod, also the central portion of the extension of the body at 6. When the Wilson reamer cutters are collapsed, there is interposed between them the lower end of the T-rod and the bottom bolt or safety bolt. The faces of the body extensions, 6, shown in the patent, which coact with the cutters when expanded, are parallel to each other and the axis of the reamer body. In the Wilson reamer the faces which coact with the cutters, causing expansion when the cutters are expanded, are at an angle to each other and the axis of the body. The mandrel and key of the Double underreamer shown in the patent is replaced by a single piece T-rod in the Wilson reamer. The downward movement of the cutters in the Double underreamer is limited by the

(Testimony of W. W. Wilson.)

striking of the key on the lower edges of the slot in the extension. The same movement of the cutters in the Wilson reamer is limited by the means of a pipe placed on the T-rod inside of the spring, which butts against the block on the lower end and the nut on the upper end of the T-rod, limiting their throw or downward movement. The dovetails in the Double underreamer are placed at an angle from the vertical axis of the body, while in the Wilson reamer the shoulders are placed parallel to the axis of the body. The dovetails, 29, of the cutter shown in the patent, figure XI, are placed on the cutter so as to be at an angle to the axis of the reamer when the cutters are in an expanded position. The dovetails on the cutters of the Wilson patent are so placed as to be parallel to the axis of the reamer when in expanded position. On the Wilson reamer, at the bottom, or near the bottom, of the forks, there is a bolt passed through from one fork to the other. No bolt or inserted piece is shown in the Double underreamer patent. [193] In the Double underreamer shown in the patent, the spring is retained at its lower end in position by the counter-bore or shoulder 5. In the Wilson underreamer shown in "Complainants' Exhibit Wilson Underreamer," there is a block which is placed on the T-rod beneath the spring, which block is held in position by side screws, threaded into the interior of the body, which have projections on their inner ends extended in the holes in the block. In the "Complainants' Exhibit Wilson Underreamer No. 2," the spring at its lower

(Testimony of W. W. Wilson.)

end is held in position by a key passed through a slot in the underreamer body at a point above the faces against which the upper ends of the cutters bear when in working position. In order to locate this key centrally, a slot is made in the T-bar allowing its passage. Also in this exhibit the downward motion of the cutters is limited by the upper end of this slot coming in contact with this key. In the Double underreamer, the cutters are expanded to working position first by spreading-means interposed between the backs of the cutters and, second, by the upper ends of the cutters traveling upward on the inclined dovetailed ways, drawing the upper ends of the cutters closer together, which action acting upon the fulcrum or bearing, 18, causes the points or working edges, 19, of the cutters to be still further expanded. In both the Wilson exhibits, the cutters are expanded solely by having expanding means thrust in between the outer edges of the cutter.

In the Double underreamer patent the cutters are expanded by means consisting of a continuous edge or working face acting on each cutter. In the Wilson underreamers, the cutters are expanded by two widely separated faces acting on each cutter.

As to the method of operation, the cutters on each of the Wilson underreamers and also those of the Double patent are drawn to contracted position. The reamer is then entered in the casing and the cutters are retained in contracted position by their contact with the walls of the casing. The under-

(Testimony of W. W. Wilson.)

reamer is lowered to a [194] point beyond the lower end of the casing, when the releasing pressure of the casing allows the cutters to be drawn up into expanded position by the spring pressure, at which time reaming is commenced; and, when it is completed, the underreamer is withdrawn, the cutters striking on the shoe of the casing, causing them to be retained stationary while the body is withdrawn partly, in the case of the Double patent, and completely, with the Wilson exhibits from between the cutters, which allows them to collapse and follow up the casing.

As to the method of assembling the reamers for operation in the Double underreamer patent, there are necessary two sets or divisions in the operation of assembling. First, the spring is put on the mandrel rod, together with the nut, and a cotter-pin, and placed in the lower half of the Double body. The upper half shown at figure II in the patent is then screwed onto the lower half, completing the first operation. Second: Screw 28 is screwed into the lower end of the mandrel rod and means exerted to draw the rod to the lowest position. One cutter is placed in the body and the key, 17, is then put through the slot in the body extension and through the slot in the mandrel and into the pocket, 16, in the cutter. The other cutter is then placed on the body so that its pocket, 16, is over the end of the key, 17. A punch is then put through the hole, 20, in the first cutter placed, and by this means the key, 17, is forced into central position. The rod, 11, then is allowed to partly re-

(Testimony of W. W. Wilson.)

lease, hooking the rod in the slot, 22, in the bottom of the key. The mandrel is then further released, leaving the cutters in working position.

In assembling the Wilson underreamer shown in "Complainants' Exhibit Wilson Underreamer," the block is placed on the T-rod; the spring is placed on the T-rod; the pipe is placed on the T-rod. The nut is then screwed on to the thread on top of the T-rod and retained in position by a cotter-pin. The cutters [195] are then put on the T-rod and then the T-rod with parts thereon and cutters are put on into the body and slid up as far as they will go. Means are then exerted on the block to press it up into position, and the side pins are then screwed into the body so that their extensions extend into the block, supporting it in that position. Then the bottom bolt is screwed into the body and retained with a cotter-pin.

In "Complainants' Exhibit Wilson Underreamer No. 2," the spring is put on the T-rod and retained in position by the nut and cotter-pin at the top. The cutters are then placed on the T-rod and these parts are put into the body. The key is then driven through the slot in the body and by means of its tapered upper edges catches the spring and forces it up into position. The key is then driven on through until it is central with the body, when the extension on the lower side drops down into the bore of the body, retaining it in this position. The bottom bolt is then screwed into the body and retained by the cotter-pin.

(Testimony of W. W. Wilson.)

In comparing the strength of the reamer disclosed in the Double patent and the underreamers "Complainants' Exhibit Wilson. Underreamers" and "Wilson Underreamer No. 2," the body of the Wilson underreamer is shown to have more strength than the Double underreamer by reason of the fact that there is no joint in the middle of the body, it being a single piece. Also, there are no pockets cut out on the sides of the body for the wrench. The dovetails on the Double body shown in the patent, being at an angle to the axis of the body, are necessarily narrow at their lower ends, interposing a small amount of metal at this point to the shearing out of the dovetail which might be caused by a tendency to spread the lower ends of the cutters. In the Wilson underreamers these dovetails being parallel to the axis of the body, they may be placed closer to the axis of the body at the lower ends, giving more strength at this point. [196] In figure VII in the Double underreamer patent, it is seen that there are small bearings which the key butts against at its lowermost position by reason of the fact that there is a limit to the width of the partition interposed between the cutters at said point, and also the hole itself must be sufficiently large to allow free movement of the mandrel rod. This may be cut out or extended down by repeated blows from the key.

In the "Complainants' Exhibit Wilson Underreamer," this strain is taken by the pipe block and side-screws which may be given a comparatively large surface for resistance. The spreading-bear-

(Testimony of W. W. Wilson.)

ing, 6, in the patent may become worn by compression against it of the cutters, and in this way it may be compressed together, tending to close the hole in it in which plays the mandrel rod. This may cause binding of the rod when it is drawn to its lower position. In the Wilson underreamers, if the spreading-bearings become worn or compressed, there are no moving means near these parts which may become jammed or stuck. Also, these points in the body project from the main body of the metal in such way that they may easily be tempered, making the metal hard and highly resistant to wear. This would be difficult in the Double underreamer disclosed, though it may be possible. However, due to the shrinking of the metal, there would be great danger of cracking the metal between the lower end of the key-slot and the bottom of the reamer body or extension.

In the use of the Double underreamer disclosed, it is difficult to get at the spring to clean it out in case it becomes clogged or packed with mud or drillings, as the joint in the body must be unscrewed to accomplish this. The joint in this body is not unscrewed in the ordinary practice of changing cutters. In the Wilson reamer, in order to get the cutters off of the body, the spring as well as the T-rod must be withdrawn from the reamer body for such replacement, at which time the spring may be inspected and cleaned if necessary. [197]

In the cutters disclosed in the patent, there is a notch cut in the back of each cutter to permit their

(Testimony of W. W. Wilson.)

collapsing. No such notch appears in the cutters of either of the Wilson underreamers. The notch necessarily weakens the ability of the cutters to stand either the spreading-action applied to the cutting points, or to a collapsing strain applied to the cutting points of the cutters. It is desirable to have the distribution of the metal in the shanks of the cutters distributed over a wide space along a plane through the center of the cutter perpendicular to the bearing-faces as the main strains placed on the cutter act in this plane. Anything which reduces the thickness of the cutter or thickness of the shank must necessarily weaken the cutter unless greatly widened to compensate. This is particularly the case where the shoe-notch or shoulder shown just below the hole, 20 (Fig. X), of the patent removes the metal; and at this point also the pocket, 16, also appears removing the metal.

In the Double underreamer disclosed, the cutting-faces of the cutters are narrow compared to the diameter of the body. This is made necessary by the fact that if the cutter is widened, it must either be widened throughout its length, which would reduce the strength of the dovetail in the body, or the lower end of the cutter might be widened, which, however, might cause serious prying action on the dovetails of the cutters or of the body. This strain would be caused by an action as follows: In case the underreamer cuts a certain place in the circumference of the hole on one downward stroke, and then on rising should be turned slightly, and then descending strike

(Testimony of W. W. Wilson.)

another blow, this blow would come on one point at one side of the cutter and on the diametrically opposite point of the other cutter. This would cause a collapsing strain on the cutters, which strain is applied to this outer point on one cutter, re-acted against by the central spreading-bearing, causing a strain on the opposite dovetail shoulders. This rocking action would tend to round the bearing-faces of the cutters, placing the center re-action closer and closer to the center of the [198] cutter, giving the strain each time greater leverage on the dovetails, which would be likely to cause their straining and, later, their breaking. In the Wilson reamers shown, the bearing-faces, though the lower end of the cutter may be widened, are still placed at the outer edges of the cutter; and should the faces be battered in, could still not remove the fulcrum to the center of the cutter or near it, and consequently this strain could not occur in the Wilson reamer. The key in the Double reamer disclosed must necessarily be thin; for, if it is thick, a wide slot must be cut in the mandrel rod for its passage there through. This would weaken the mandrel rod and, as before shown, the size of the mandrel rod is limited by the size of the hole that may be drilled through the central partition of the body extension. There is no such limit to the width of the lugs on the lower ends of the T in the Wilson reamers, except that the width of the pocket in the upper ends of the cutters is not widened by this action to the point of weakening it. Therefore, there is less chance for binding or shearing off the

(Testimony of W. W. Wilson.)

end of the T-rod in the Wilson reamer than in bending or breaking the key of the Double underreamer disclosed.

In the working of the Wilson underreamer, it is impossible to dislocate sideways the lugs on the T-rod. However, it might be possible to dislocate sideways the key on the Double underreamer disclosed, which would throw all the strain on the smaller amount of metal, thus acting against the cutter.

In the Double underreamer disclosed, the means of increasing the expansion of the cutters may be altered to give them greater expansion by any or all of the following means: A. The length of the cutter upward from the shoulder, 26 (Fig. XI), might be shortened, thus causing greater tipping in the cutter. B. The length of the cutter extending below the face, 18, may be increased. C. The angle between the dovetails and the axis of the body may be increased. And, D, the width of the spreading-bearing, 6, may be increased. The length of the cutter-shank must not be seriously [199] shortened, as this increases the leverage of the cutters against the dovetails. This leverage is also increased by lengthening the cutters downward from the face, 18. This is also objectionable to depend on. As the cutter wears, this length is decreased and, if this is depended on for expansion, the cutters may be worn back for a reasonable length and then when it is dressed out sufficiently to ream the hole large enough, the reamer cannot be run down the casing. The

(Testimony of W. W. Wilson.)

angle of the dovetails cannot be materially increased because, if so, the strength of the lower ends of the dovetails is weakened, making them liable to be torn out. The width of the spreading-bearing, 6, cannot materially be widened because it requires that in order to collapse the cutters, a deeper notch must be cut in the shanks thereof. Also, this would leave less room in the body of the shanks. Therefore, they would have to be narrow. In the Wilson under-reamer, the expansion is caused by the spreading-faces of the lower end of the prongs of the extension, which are forced between suitable shoulders on the edges of the cutter body.

Testimony of Bert Lewis Culver, for Defendant.

BERT LEWIS CULVER deposes and testifies as follows:

My name is Bert Lewis Culver; age, 40 years; residence, Whittier, California; occupation, oil well superintendent. I have been engaged in the business since I was fifteen years old. Have operated in Pennsylvania before coming to California. Have worked in various old-fields in California. Have been with the Central Oil Company of Whittier for several years. I also operated in Wyoming. Have been acting as field foreman for the Central Oil Company. Am to take a position with the Premier Oil Company at Coalinga on the first of the month. Have operated the Austrian underreamer. The first was the Austrian underreamer. Probably in the year 1900. [200]

Q. 24. Please tell us about the experience you had

(Testimony of Bert Lewis Culver.)

with this Austrian reamer at that time; also specify, if possible, where in Los Angeles it was you had the experience.

A. It was on the Rex Oil Company's property on Adobe street, in Los Angeles. I think the first well was number 6. Previous to that time we had no underreamer, no way of getting casing down, and the only way we could do when we met that hard formation was to stop our casing, as we could not drive it through. The first time we used the Austrian underreamer it was successful, and we thought it was a great thing. It was a great thing. The first one I used was with a $5\frac{5}{8}$ casing. I was able to lower the casing after using it. Probably reamed three hundred feet. I used the Austrian underreamer many times after that for about two years. I cannot state the wells. I have used the Leidecker, Double and Wilson underreamers. Used the Leidecker after having used the Austrian. That was in 1903, possibly.

Q. 37. Please tell us about this use, as to where it occurred and what further you have to state about it.

A. I used the Leidecker reamer on a well I was drilling at that time by contract for W. E. DeGroot, on Sixth street, beyond Western, directly back of what was known at that time as the Pellisier ranch, Los Angeles. I was using, had been using, an Austrian reamer. We encountered a hard shell—possibly seven feet thick we found afterwards—and we had spent a great deal of time, possibly three or four days, with the Austrian reamer, and came in town

(Testimony of Bert Lewis Culver.)

and got the Leidecker, or Swan, as it called there—which is one and the same. I took it out with me early in the morning and brought it back at night and got my casing through the hard shell.

Q. 38. Did you use this reamer after that occurrence? A. Of the make of reamer, do you mean?

Q. 39. The same kind of reamer; yes. [201]

A. The next time I used the Leidecker reamer was in Wyoming. The firm I was with sent to Los Angeles and bought one.

Q. 40. Where in Wyoming, and when?

A. Evanston, Uinta County.

Q. 41. And when?

A. About six months after that.

Q. 42. Please state your experience with the reamer there?

A. I used it to good advantage; was successful with it. Had some trouble getting it down the casing in each instance I used it, however. It did the work after I got it down.

The next reamer I used was the Double. That was on the Central Oil Company's property at Whittier in 1905.

Q. 51. Please tell us about this experience with the Double reamer in 1905 at Whittier.

A. We had at that time on the Central Oil Company's property, I suppose, every sized reamer that the Double people made; used them every day, probably every working day, in the month or year, and used them successfully. We had some trouble from time to time, losing cutters, but so far as the ream-

(Testimony of Bert Lewis Culver.)

ing goes, the reamers did the work. They are a good reamer—superior to the ones that I had used previous to that time.

Q. 52. Can you tell us how the losses of the cutters occurred?

A. Sometimes by cutters breaking at the key-hole, sometimes by the T-bar breaking. At that time they made what I would term a T-bar that was unlike this key they put in now. They had a tongue on this key that ran up the reamer a ways, if I remember right. Sometimes that T-bar, I would call it, would break in two in the middle and leave both cutters in the hole. I never fished one out in my life. We always had to drill them up. Sometimes those cutters, or pieces of cutters, would get behind the casing, cause dents in the casing, and compel us to pull out casing to remove the joints that had the dents in them. [202]

Used first Wilson reamer in about 1907. Are still using those Wilson reamers on that lease. We used some Double's during that time. The safety bolt in the bottom of the Wilson reamer is to keep the cutters from dropping out. The Wilson reamer gave splendid success. Don't recall an instance of losing a Wilson Underreamer Cutter.

A. 64. For some reason unknown to me, I have had less trouble getting the Wilson reamer started on a shell than I have the Double. I can't explain it, and never could.

Q. 65. I suppose one difficulty in determining that reason was that you could not see what it was doing

(Testimony of Bert Lewis Culver.)

there? Am I right in that? A. Yes, sir.

I think the Central has only one Double reamer in use at this time. Some Wilson reamers came to us without safety bolts in the bottom but we put them in.

Q. 77. Have you any general preference as between these two types of underreamers, the Wilson and the Double? A. I have.

Q. 78. Please state that. A. The Wilson.

Q. 79. Have you any other reasons for this preference which you care to state, further than those mentioned?

A. My one preference is I consider the Wilson a safer reamer to run in the hole, and my experience has been, having the protection of the safety bolt against loss of cutters.

Cross-examination.

(By Mr. LYON.)

Q. 80. Then you would not consider that the Wilson underreamer would be a safe reamer to run in the hole if you removed this safety bolt? [203]

A. No, sir.

Q. 81. You would not?

A. May I recall that answer?

Q. 82. You can amplify it if you wish to; yes.

Mr. BLAKESLEE.—Explain it.

Mr. LYON.—Explain it all you want.

Mr. BLAKESLEE.—Make it just as you want it.

A. Well, I consider it as safe as the Double without it, but, with it, safer.

Q. 83. (By Mr. LYON.) How does this safety

(Testimony of Bert Lewis Culver.)

bolt in the Wilson reamer render it, in your opinion, more safe than the Double?

A. This cutter cannot get off of there until it gets down.

Mr. LYON.—Witness refers to head of the spring-actuated rod in “Complainants’ Exhibit Wilson Reamer.”

A. I consider the construction of that T stronger than the Double. It makes it safer.

Q. 84. Your preference, then, is for the head of the spring-actuated rod to be formed in one piece, or integral, with the spring-actuated rod. Is that it?

A. Yes, sir.

Q. 85. What would be the effect, in the Wilson reamer, if one side of this T-head should break? You would lose the cutter on that side, would you not? A. No, sir; I don’t think you would.

Q. 86. Why not?

A. Because I don’t think that piece could get out of the cutter. As long as it was in the cutter it would rest on the T-bolt.

Q. 87. That is due to the fact, then, that the sockets for the head of the T-bolt in the cutters of the Wilson reamer do not extend clear through the cutters? A. Yes, sir. [204]

I have found considerable prejudices among drillers in California as to different reamers, depending upon their personal experience. I consider the Double underreamer a stronger reamer than the Austrian. Loss of tools in the hole is some times due to carelessness and is sometimes due to defective tools.

(Testimony of Bert Lewis Culver.)

I have used Austrian underreamers in Whittier, on the Central property since we got the first Double reamer. The Murphy Oil Company at Whittier is still using the Austrian underreamers. It is called the Austrian—they call it the Plotts. It is similar in construction. I find no such key in “Complainant’s Exhibit Wilson Underreamer” as that found in the Double underreamer. That metal immediately surrounding the slot in the Double underreamer body acts as a bearing for the cutters; when in expanded position the cutters bear against it.

The tool-dressers and drillers at the wells dressed the bits for our Double and Wilson reamers. When a cutter has run long enough, or immediately it begins to do its work, it begins to wear on this wearing surface, as we term it; and the cutter, to do efficient work, must be kept out so this point clears every other part of it—a keen-cutting surface as that has. (Pointing to the lower edge of cutter of “Complainant’s Exhibit Double Underreamer.”) I mean by “dressing” that we kept this cutting edge out flush with the back part of the reamer, and tried to keep it further, as this one is dressed. (Witness refers to cutter of “Complainant’s Exhibit Wilson Reamer.”) The Double reamer bit to which I have just referred has not been dressed. The Wilson bit has, about three-eighths of an inch. “Dressing” is done by putting the bits in a fire, getting sufficient heat to work them nicely. Good judgment has to be exercised not to overheat. They are heated to a red heat, then upset with a hammer, then tempered.

(Testimony of Bert Lewis Culver.)

Care is required in the tempering. Some times we have difficulty in suitably dressing and tempering these bits at all; some times they crack, check. Very often we get a tool-dresser who is not sufficiently [205] skilled to do the best kind of work; have considerable trouble in that line in California; before coming to Whittier from Wyoming, I had heard of the Double reamer, because it was a good reamer. I suppose that good things get a reputation; had very little use for an underreamer in Wyoming.

Q. 115. How long did you continue in Wyoming?

A. Two years, exactly.

Q. 116. And what kind of wells were you drilling there? A. Oil wells.

Q. 117. And how many did you drill? A. Two.

Q. 118. What depth?

A. One of them twenty-one hundred and the other eighteen hundred feet.

Q. 119. What were the formations which you encountered in Wyoming? A. Hard sand and rock.

Q. 120. Much of it?

A. Broken and in streaks. The character of the formation was mostly a hard, sandy formation.

Q. 125. When drilling for the Rex Oil Company here in Los Angeles, in about 1900, did you have much use for an underreamer? A. Yes, sir.

Q. 126. At that time had you ever heard of any other underreamer than the Austrian? A. No, sir.

Q. 127. Would you at that time have used the Austrian reamer if you could have got at that time a Double reamer? A. No, sir. [206]

(Testimony of Bert Lewis Culver.)

If I had known of the Double reamer then I would not have used the Austrian. The Double reamer is a better reamer, its construction is stronger, and it had more cutting surface. We very often break various tools during the drilling operation. It is very severe on all of the tools. One of the expenses of drilling wells in California is due to the great number of breakages of tools and losses of tools. I mean tools lost in the well necessitating fishing jobs. These are due often to the carelessness on the part of the driller, and sometimes to defective tools. Carelessness of the driller in not properly running the tools, not properly setting up joints, etc. After I first got hold of a Double reamer the only time I used an Austrian was at Whittier. It was a 6 $\frac{1}{4}$ inch reamer. Had no other that could be used at the time—or perhaps the others were all in use. Used it very little, possibly reamed two or three feet.

Q. 144. Then, to sum up your testimony, you would not consider the Austrian underreamer either a practical or a safe tool to use on a hard job of underreaming? Is that correct?

A. No, sir; I would consider it a back number.

Q. 145. Your answer to my question, which was put to you in the negative, might infer that you disagreed with the question. You meant that you would not consider it a safe tool or a practical tool to use on hard reaming? Is that the idea?

A. That is what I mean.

Q. 161. Comparing the modes of expansion and contraction—and by that I mean the action of the

(Testimony of Bert Lewis Culver.)

bits in swinging from their collapsed position to their expanded position, or from their expanded position to their contracted position, and the surfaces on which they ride, are not these substantially the same in the Wilson and the Double reamer?

Mr. BLAKESLEE.—Objected to as assuming a fact or result not testified to, or with relation to, by the witness.

A. I can see but very little difference. [207]

Q. 162. (By Mr. LYON.) The Wilson reamer has two parts which the side faces and shoulders ride in, in expansion, has it not? A. Yes, sir.

Q. 163. While the Double has simply a single face?

A. It has.

Q. 164. Both the Double and the Wilson reamers have side slots which have dovetails which coact with dovetail-shoulders on the bits, have they not?

A. Yes, sir.

Q. 165. And in both reamers these act in the same manner, do they, and for the same purpose?

A. They operate the same way. It is up and down the same way.

Q. 166. And they are for the same purpose?

A. To hold the cutters to the body of the reamer.

Redirect Examination.

Q. 170. (By Mr. BLAKESLEE.) Please tell me what you meant, in your cross-examination, by the slot at the lower end of the body of "Complainants' Exhibit Wilson Underreamer?"

A. Why, I meant that.

(Testimony of Bert Lewis Culver.)

Mr. BLAKESLEE. — Witness points to the space—

Mr. LYON.—Witness points to the cut away—

Mr. BLAKESLEE.—“Space” is better.

Mr. LYON.—between the lower end of the parts of the end of the Wilson underreamer, which parts have been termed “forks” by him.

Mr. BLAKESLEE.—“Forks” or “prongs.”

Mr. LYON.—“Forks” or “prongs,” and which portion has been referred to by other witnesses as a “slot.”

Q. 171. (By Mr. BLAKESLEE.) Please compare this opening with the corresponding slot you refer to in “Complainants’ Exhibit Double Underreamer.” That is this one (showing). [208]

A. The Double reamer has a slot in it I should say four inches long, possibly three-quarters of an inch wide. I am describing the key-way.

Q. 172. What is that slot formed in?

A. In the bottom of the reamer, bottom of the end.

Q. 173. Do you find any such key-way in “Complainants’ Exhibit Wilson Underreamer?”

A. No, sir.

Q. 174. Please state what parts of “Complainants’ Exhibit Double Underreamer” and “Complainants’ Exhibit Wilson Underreamer” are between the bodies of the cutters?

A. The Double reamer is closed at the bottom, having the slot as I describe; while the Wilson reamer is not closed at the bottom.

(Testimony of Bert Lewis Culver.)

Q. 175. Do you find in "Complainants' Exhibit Double Underreamer" anything corresponding to the safety-bolt you have referred to in "Complainants' Exhibit Wilson Underreamer?"

Mr. LYON.—Objected to as leading.

A. I do not.

Q. 176. (By Mr. BLAKESLEE.) When you referred to the Austrian underreamer as "a back number," please state what you meant by that, more fully.

A. I meant we had something so much better that it would be folly to use anything of that kind.

Q. 179. I believe you have testified you had breakages occur in the bits, in the shanks, of the Double underreamer used by you, at the openings of the shanks. Have you any explanation to offer as to the breakage at this point?

A. My reason would be that the hole clear through weakens the bit.

Q. 182. Can you state what happens in the Double underreamer, when the cutters are collapsed? [209]

A. It makes it smaller.

Q. 183. Can you state what happens, at this time, with respect to the ends of the key and the recesses in the cutter-shanks in the Double reamer?

A. Well, it is hard to tell what happens. That is a pretty hard question to answer. I know that is the time the key breaks, when it does break. It is the only way it could break. The only reason why it can break is when it is down against the bottom of that

(Testimony of Bert Lewis Culver.)

slot. The distance of the cutters coming into the pipe causes it to break.

Q. 184. In the collapsing of the cutters of the Wilson underreamer, please state how the shanks of the cutters move when the cutting ends of the cutters move down over the spreading-ends of the prongs?

A. The slots in the cutters roll on the ends of the T-bar. They move on a roll,—have a rolling movement.

Recross-examination.

(By Mr. LYON.)

Q. 190. When you say “rolling,” as applied to the movement of the Wilson bit on the head of the spring-actuated rod, you mean a tilting or pivotal movement?

A. Yes, sir; I mean that movement.

Q. 191, And that is permitted by the key-seat or socket in the shank of the bit being larger than the head of the T-rod?

A. It is permitted by its having sufficient room to tilt.

**Testimony of J. Benson Wrenn, Defendant's
Witness.**

J. BENSON WRENN deposes and testifies as follows:

My name is J. Benson Wrenn; age, 55; manager of Traders Oil Company. I have full charge of the development or production department. Have been in the oil business since 1898. My experience brought me very extensively in touch with oil well tools.

(Testimony of J. Benson Wrenn.)

[210] Am acquainted with the various kinds of underreamers. I used an Austrian underreamer in 1899. Owing to the fact that the driller who first used it was intoxicated he did not run it below the casing and operated in the casing, cork-screwing the casing.

My next experience was at Coalinga in 1907. I bought and ran three Wilson,—10 inch, two eight and a quarters, and six and five eighths, using them continually from that time on. During that period I also used one Double of the older pattern, 12½ inch. I now have four or five Double reamers. “Complainants’ Exhibit Double Reamer” is the general type, of course they have made slight differences in them, and improvements, of course. This exhibit represents the general plan of both the first and second kinds of Double reamers. I don’t know that I could specify the change made in the Double reamer unless I had the first Double reamer before me. The new reamer has more stock in it—much heavier,—a very great improvement over the old. I was rather unfortunate in the use of the first Double reamer and became considerably prejudiced against the reamer, in that the joint of the 12½ that I was using, the pin, broke off, leaving the whole bottom part of it in the hole, causing me to have to move the derrick and drill a new hole. That was in 1907 or 1908. The pin broke off square and we could not fish it out. We had to move the rig and redrill the hole. I should judge the abandoned hole had cost me to that date between fifteen hundred and two thousand dollars.

(Testimony of J. Benson Wrenn.)

The underreamer itself I had to pay for, which was, I think, three hundred and some dollars. It was rented.

My experience with Wilson underreamers was very satisfactory. I have used six or eight Wilson underreamers. The Wilson reamer body having no middle joint did not give the trouble I had with the Double. I probably drilled forty or fifty wells with Wilson underreamers. I have Wilson reamers re-machined. It makes practically new reamers of them. You cannot perform such an operation on the Double reamer. [211]

During the use of the Double underreamers I think I have never had occasion to repair them. I have used the Double as extensively as the Wilson. I don't think the re-machined Wilson reamers were as good as the original, still they give very fair service. I always considered that the Wilson was the safer machine or tool because it had no joint in it, basing, of course, my idea—deductions—on the accident I had from the joint. I still have in use Wilson reamers purchased in 1907 or 1908 and Double reamers purchased in 1909 or 1910. There are no other reamers in use in our field except the Double and the Wilson. I think there are more Doubles in use than Wilsons, I don't know.

I have lost the cutters or lugs off Wilson reamers, due to breakages inside the Wilson reamer. I have lost both cutters or lug, and I have lost one. In one case I also lost the spring-actuated rod. This Wilson reamer had in it the bottom or safety bolt. In this

(Testimony of J. Benson Wrenn.)

case the dowel-pins broke. I never had any difficulty in losing tools in the well hole, except the loss of this portion of a Double reamer, which I have referred to, I lost the two Double lugs, by splitting, and this loss of parts of the Wilson reamer. I mean parts of underreamers. Other tools, yes, I have lost hundreds of them in the hole. I lost a drilling bit in the well hole by reason of the joint unscrewing. That was due to lack of proper facilities for setting up the joint. Fishing for lost tools is one of the common and unfortunate experiences in drilling wells. It is due to various breakages of the tools and to the carelessness of the drillers. I never had a Double or Wilson reamer key-seat as that Austrian did.

Q. 108. Is there any particular difference, in your opinion, based upon your experience, with the Double and the Wilson reamers, in the manner in which said reamers are constructed to procure the collapsing and expansion of the bits or cutters?

A. I think they are very different.

Q. 109. In what respect? [212]

A. Well, the Double is set in through this joint, whereas the Wilson is held by these dowel-pins and the block.

Q. 115. And your prejudice against the Double underreamer arises from the loss of the lower portion of this Double reamer in the hole due to the breaking of this pin?

A. It was, at that time. I can't say that I am prejudiced against it now—the new improved Double.

(Testimony of J. Benson Wrenn.)

Q. 116. Well, hasn't the new improved Double the same pin at the box joint? A. I think so.

Q. 117. And then, if I understand you correctly, you would say that, in your opinion, either that the Double was as good as the Wilson or the Wilson was as good as the Double? A. The improved; yes.

Q. 118. And from your standpoint you see practically no difference whatever between the two reamers last referred to?

A. There is a difference in the structure of the reamer, but not in the service of it.

The only advantage in re-machining a Wilson reamer is that you can get some service out of it before you put it into the junk pile. I have never had a Double underreamer re-machined.

**Testimony of William W. Wilson, for Defendant
(Recalled).**

Testimony of WILLIAM W. WILSON, cont., recalled.

The witness continues his answer to question number 15:

A. The expansion of the Wilson underreamer can be made large due to the fact that the cutters collapse completely together in closed position, and there being none of the body interposed between them. The cutters may be expanded widely, due to the fact that there is a very little limit to the widths that the spreading-bearings on the bottom of the prongs can be made, except to leave [213] strength in the over-hung spreading-bearings in the bottom

(Testimony of William W. Wilson.)

of the cutters sufficient to stand the strain. The bottom bolt is a feature of the Wilson reamer which does not exist on the Double reamer, and allows, in addition to the usual means which limit the lowest travel of the cutters, a separate and unused means of catching them under ordinary circumstances. This bolt comes into use only when excessive wear or breakage of other means provided for limiting the cutters is allowed.

The tapered bearings shown at the sides of the prongs at the bottom of the Wilson extension allow the cutters to be drawn into their final expanded position with great force, due to the gradual taper of these bearings and strength of the spring. This allows the cutters when lowered below the casing and when no shell has been formed—in other words, the diameter of the hole below the casing—is that or nearly that of the inside of the casing. This taper allows great pressure to be exerted against the sides of the hole, and in this manner a shell may be started in a short time, which, as soon as opened up to the full diameter to be underreamed, allows the cutters to be in complete expanded position, allowing further reaming to be carried on in the usual manner. The expansion of the Double underreamer caused by the steep, angular spreading-bearings at the bottom of the extension or partition allows only small force to be placed against the spreading-action of the cutters, until they are almost in complete expanded position. The Double cutter, in order to completely collapse, must have the upper ends of the cutters thrown

(Testimony of William W. Wilson.)

outward so that the dovetail shoulders on the cutters bear against the outer sides of the ridges or undercuts in the body of the extension. When these parts become worn, when the cutters are collapsed running down the pipe, the friction of the pipe, also blisters, and irregularities at the joints, may, acting on the riding surface of the cutter, tend to rock the cutter on the spreading-bearing, throwing the [214] upper part of the shank in and pitching the lower points out. When the cutter is worn badly and dressed out at the sides, this may make it difficult to get the reamer down the casing. At such time the tying of the cutters together is resorted to. The riding surface of the Wilson cutter being longer than the Double, and there being no tilting action of the cutter, this does not occur.

As to the variations possible in the construction of the two, it will be seen that the Double cutter may be narrowed until such cutter body or lower part is no wider than the width of the shank outside of the dovetail shoulders. Also, the body of the cutters might be decreased still further in width. Still the cutter would be operative. Consequently the action of the cutter does not depend on the extension of the cutter body outside of the dovetail shoulders. In the Wilson cutter, if the cutter body is narrowed to the width of the outside of the dovetail shoulders of the cutters, the cutter will be inoperative. In other words, the action of the cutter depends on having the body of the cutter extended sideways to a width greater than the outside of the dovetail shoulders.

(Testimony of William W. Wilson.)

Q. 16. (By Mr. BLAKESLEE.) I wish you would particularly compare the modes of operation and particularly define the centers of motion of the cutters of "Complainants' Exhibit Double Underreamer" and "Complainants' Exhibit Wilson Underreamer" and "Wilson Underreamer Number 2," in the collapsing action of the cutters.

A. In the "Complainants' Exhibit Double Underreamer" the cutter at the beginning of its downward travel in collapsing has its upper end slightly raised outward, due to the angle of the dovetail, and tilts or tends to revolve over a center which travels, in respect to the cutter, up over the lower, inner spreading face of the cutter, but which center is stationary with respect to the body and is located at the corner of the parallel bearing face and angular bearing face at the bottom of the partition of the body. This action is continued until the moving center, with respect to the cutter, reaches the beginning of the notch on the cutter back, [215] at which time the movement of the cutter changes to a center probably moving but which is difficult to determine without drafting, caused by the inward tipping of the lower end of the cutter and the continued outward tipping of the upper end of the cutter. This action continues until the cutter is in a completely collapsed position.

In the Wilson underreamer shown in "Complainants' Exhibit Wilson Underreamer" and "Wilson Underreamer Number 2," the collapsing consists of a pivotal action of the cutter, the center of this action

(Testimony of William W. Wilson.)

being at the point where the dovetail shoulders on the cutter begin to be beveled away at the top of the shank. The point of contact or intersection of these two planes forms a line, which line is the center of the tilting action of the cutter. The first part of the collapsing is caused by the gradual collapsing of the cutter due to the riding surfaces on the backs of the cutters traveling down the slightly tapered parts of the extension bearings on the bottom of the prongs of the extension. The second part of the collapsing is caused by the rounded corner where the riding face on the backs of the cutter meet the tops of the side-wise extension of the cutter back, these points traveling over the steeply tapered faces of the bottom of the body prongs. The travel of the center of the tilting cutter with respect to the body is at all times a straight line. The line through the cutter constituting its center traveling downward, forms a plane or describes a plane, in which plane lie the inner faces of the dovetail shoulders on the inside of the prong. In other words, the tilting of the cutter of the Double underreamer is about a centroid or moving center with respect to the cutter. The tipping Wilson cutter is about a center, stationary with respect to the cutter.

I am employed by the Wilson & Willard Manufacturing Company, the defendant in this suit, and a brother of Elihu C. Wilson, the president of that company.

Q. 19. I now show you a copy of patent number 683,352 of the Swan underreamer, issued September

(Testimony of William W. Wilson.)

24, 1901, and ask you if you are [216] acquainted with the disclosures of this patent. A. I am.

Q. 20. Will you briefly summarize the construction, interrelation and mode of operation of the subject of this patent?

Mr. LYON.—Objected to on the ground that the said patent is not a part of the art prior to the invention of subject matter of the patent in suit by Edward Double.

Mr. BLAKESLEE.—Attention is called to the fact that this patent of Swan issued upon a day antedating the date of the application which eventuated in the patent to Double in suit, and it is therefore contended that this patent to Swan is wholly and without qualification in the prior art in respect to the Double patent in suit.

A. This underreamer consists of a body comprising two parts, said parts being joined together by threaded portions to allow access to an inner chamber in which is placed a spring intended to actuate the cutters. Through the lower half of the body is a hole drilled axially, allowing the passage of a rod which terminates at its upper end in a head or button against which bears the top of the spring. The lower end of the spring bears against and fits over a shoulder turned on the upper end of the lower half of the body. This rod extends downward between the parts of the body on which the cutters ride. In the extension of the body or part thereof below the faces against which the cutters bear in their working position, shown in figure 3 at A9, there is a centrally

(Testimony of William W. Wilson.)

located slot passing through the extension in a plane perpendicular to the backs of the cutters, in which is allowed to play a key, which key passes through a slot in the lower end of the mandrel rod shown in figure 7 at B3. In each end of the key shown at B4, figure 15, are holes shown at b4 for the passage of suitable retaining means for maintaining the key in central position. These retaining means fit into or are allowed placing by the extensions of the slots in the cutters; said slots shown in figure 13 at C2, [217] said extensions of this slot shown at C3, figure 13. In the sides of the extensions are pockets planed out for the reception of cutters. These pockets have under-cut shoulders or dovetailed spaces machined in their sides for engagement with the dovetails on the sides of the cutters, said dovetailed space shown in figure 3, A7. The faces the cutters travel on, together with the dovetail faces, taper inwardly at their lower ends. To facilitate running the reamer into the casing, additional retaining means are furnished by a shoulder shown on the mandrel rod, figure 7, B5. In the sides of the body above the extension are placed engaging means, the outer ends of which consist of rectangular pieces which have inward extensions shown at E, figure 10, which bear against the button on the mandrel rod when the reamer is being run in the casing. The rectangular ends of these retaining means at this time bear against the insides of the casing, and hold the mandrel rod in the lowest position which retains the cutters in contracted position. The expansion of the

(Testimony of William W. Wilson.)

cutters is caused by a travel along the tapered inner faces of the extension, from lower position to upward position. The upper ends of these faces being wide apart, causes the cutter to expand to working position. The upward strain on the cutter is taken by its abutment against the shoulder, A9, figure 3, in this position. To operate the reamer the cutters are drawn to the lowest position. A removable ring, figure 9 at G, is then placed over the retaining means as shown in section in figure 5, holding them in against the button on the mandrel rod. The reamer is then placed in the casing and lowered until the casing displaces the ring G in figure 9, when it is removed by the continued lowering of the reamer. This leaves the retaining means still pressed against the casing. The reamer is then lowered beyond the lower end of the casing, when the retaining means are forced outward, allowing the passage of the button B5 to pass upward, due to the pressure of the spring. This continued travel [218] draws the cutters up into working position and reaming is commenced. When through reaming the reamer may be withdrawn into the casing, the casing striking the faces shown at A, figure 14, of the cutters, forcing them downward in a collapsed position and allowing the reamer to continue upward through the casing.

I have seen a number of those reamers. I saw them in Bridgeport, Illinois, in the oil fields of 1909. I spent considerable time in the oil fields of Illinois at that time with Mr. J. M. Woods of the Bridge-

(Testimony of William W. Wilson.)

port Machine Company. He was agent for Swan underreamers in that field. He showed me a large number of Swan reamers in his warehouse at Bridgeport. I saw one Swan underreamer being used at that time. I saw the the Swan underreamer being withdrawn from the hole after underreaming. I saw probably twelve or fifteen Swan underreamers of different sizes in that field. They had all shown evidence of use.

A. 26. I was in Bridgeport at that time to investigate the underreaming business. I spent considerable time in the field in company with Mr. J. M. Woods, of the Bridgeport Machine Company, and in his company met Mr. Curt Doane, who was the agent of the Swan underreamers in that field. Mr. Doane showed me a large number of Swan underreamers in his warehouse at Bridgeport, and we later went into the field and saw one underreamer being used and three or four other wells where they had just completed underreaming operations with the Swan underreamer.

A. 33. All three exhibits disclose bodies consisting of two parts, particularly "Exhibit Swan Underreamer Patent" and the "Complainants' Exhibit Double Underreamer," said body parts being connected together by threaded portions, said parts being joined together for the purpose of giving access to a large bore in which a spring is placed, and for the removal and placing of the mandrel rod. The spring in all the exhibits on its lower end bears upon a portion of the lower half of the body, and its upper

(Testimony of William W. Wilson.)

end bears against, in one case, the solid part of the mandrel rod, and in the Double underreamer [219] against a nut threaded on the upper end of the mandrel rod. The mandrel rod extends through the lower half of the body in all the exhibits and into the extension thereof. The mandrel rod at its lower end in all the exhibits consists of the enlarged portion in which there is an elongated slot for the reception of a key. In all the exhibits there is a key passing through a slot in the extension of the body and also through the slot in the lower end of the mandrel rod, and bearing on its ends against slots in the cutters, the key in all the exhibits being long enough to at all times have its ends within slots in the cutters. The ends of the bodies of the Double underreamers shown and the end of the body of the Swan underreamer disclosed, shown particularly in figure 6, show an H or I section whose widest parts are the circumference of the body. Into the sides of this section are spaces for the placing of the cutters, which cutters in action remain for the most part therein.

Testimony of W. W. WILSON resumed—Answer to Q. 33 (Cont.).

I believe from the former report of my answer, I described the pockets at the side of the slot of the cutters shown in figure 13, Swan patent, C 3. These pockets being for the purpose of allowing room to insert retaining pins in the end of the key shown in B 4, figure 15, and a small pin, b4, figure 15. The cutters on the Swan reamer shown are expanded by

(Testimony of William W. Wilson.)

moving up the wedge-shaped extension with the dovetails in the dovetail ways shown in figure 3, A 7, thus causing expansion. In the Double underreamer shown the dovetails cut in the body are tapered inward at their upper ends. As the cutters slide upward in these ways, the upper ends are drawn inward, causing expansion of the cutters, due to the fact that the dovetail action is imparted to the cutters at a point above the fulcrum of the cutter. This action reverses the taper of the dovetail ways in order to accomplish the same result as the dovetails [220] in the Swan reamer act directly on the cutting points and not over a fulcrum. In both reamers the cutters in an expanded condition stand against the shoulders at the upper end of the extension of the body. In both reamers the cutters are limited in their downward movement by the key striking on the lower end of the slot of the extension of the reamer body. In the Swan underreamer small holes shown, c 4, figure 14, are made in the backs of the cutters for the application of suitable toggle to draw them down to contracted position preparatory to placing in the pipe. In "Defendant's Exhibit Double Underreamer," similar holes are shown on the backs of the cutters where the shank of the cutter joins the body of the cutter. These holes are used for a similar purpose.

While in Bridgeport, Illinois, in 1909 I saw one Double underreamer. It was the old style Double reamer. It was an 8".

The dovetail ways had worn so that the cutters were very loose in the body, and the cutters were

(Testimony of William W. Wilson.)

bent at the center of the shank, showing that they had been up against hard use.

In describing the Day underreamer covered by Patent No. 403,877 will say: This reamer consists of a stem rounded at the lower end for the spring. At the lower end of the rod F is a block G fastened thereto by pin through the block. In the block G are shoulders against which the cutters may bear when in expanded position. Below the shoulder H is an extension, I, which has an enlarged end, which extension is always between the cutting bodies, B. The cutters consist of bodies whose sides extend upward in flattened parts at D, forming a spring allowing sidewise movement of the cutter-head. These parts, D, at their upper ends are enlarged into pieces, E, which on their inner faces bear against the square portion of the rod, F, and which pieces are [221] fastened rigidly together by plates. As the cutters are drawn downwardly they collapse over the spreading head interposed between the cutters. The spring actuates the cutters by raising them upwardly and they expand over the spreading head on their upward motion. In comparing the Day underreamer with the Double underreamer will say that the Day underreamer discloses two cutters movable on the body, said cutters moving downwardly to contract and upwardly to expand, controlled by a spring. In this regard the action is the same as the Double. The Day cutters have pockets or grooves cut across the back to permit them to collapse over the spreading bearing. This is similar to that found

(Testimony of William W. Wilson.)

in the Double cutters. The Day cutters are allowed to spring by reason of a flexible shank to which they are attached.

I have examined the underreamer shown in Oil Well Supply Company's catalogue bearing date of 1900. The reamer consists of a body with cutters attached which collapse over a spreading bearing at the lower end and which cutters are spring actuated. The cutters bear or take up the thrust bearing at the upper end against shoulders on the body. The cutters have spaces cut out in their back. The cutters are attached to a spring actuated means by a pin which pin extends through a slot in the body. They collapse by being drawn downward below the spreading bearing and by the groove at the back of the cutters.

The model disclosing the Day underreamer was made at the Wilson and Willard Manufacturing Company's Shop.

In comparing the underreamer disclosed in cut No. 2161 of Oil Well Supply Company's catalogue of 1900, with a Double underreamer, complainant's exhibit, and defendant's exhibit, will say: Both reamers consist of bodies furnished with suitable means for attaching to string of tools. On their lower ends are two cutters which travel upwardly into expanded position and downwardly into contracted position. There is an extension on the body between the cutters which at all times remains between the cutters, and [222] over which extension or partition the cutters collapse. In all cases the cutters have

(Testimony of William W. Wilson.)

grooves planed across the backs to permit tilting or collapsing over the spreading wall or partition. The body extension of both reamers have suitable slot sufficiently long to provide for vertical travel of cutter controlling means.

In each there is a body with means for connecting to a string of tools at the top. The body is hollowed out along its axis for admission of spring and cutter retaining rings, access to which is had in the Double patent by a joint in the body, and in the O'Donnell & Willard underreamer the lower partition furnished at its upper end with a plug threaded into the body at that point, thus allowing admission to the spring chamber. The lower end of the mandrel rod in the Double reamer has a movable key, while in the O'Donnell & Willard it consists of a solid T-head on the rod. The ends of this T bear against the upper portions of slots in the cutter shank, as does the key in the Double reamer. The cutters on being withdrawn in the O'Donnell & Willard reamer close together over the lower portion of the removable partition. In the Double reamer they close together over a stationary partition between the cutters. This partition in both cases has a hole for movement of the cutter supporting rod, and in both cases is furnished with a suitable slot, which is long enough to permit travel of the key or T to give suitable movement for the cutting. The cutters in the O'Donnell-Willard reamer have shanks which fit into pockets formed in the end of the body. The outer faces of these pockets are tapered inwardly at their

(Testimony of William W. Wilson.)

upper ends, causing the cutters at their upper ends to be drawn together as the reamer is expanded. In the Double underreamer, a similar action is accomplished by the dovetail ways, which dovetail ways are tapered together at their upper ends. The collapsing of the cutters in both cases is caused by the cutters dropping down over the end of the partition, and also by the outward tilting of the upward end of the cutters, caused in the one case by the tapered pockets [223] and in the other by the tapered dovetail ways. The bearing of the cutters at their upper ends is taken by suitable shoulders on the body in both cases. In the Willard-O'Donnell reamer, additional bearing faces are furnished by the shoulder at the upper part of the cutter body, bearing against the lower outer edge of the cutter pocket. The methods of operation are the same.

I am familiar with the North underreamer covered by patent No. 674,793. That reamer consists of a body in two parts, said joints being joined together by threaded portion the same as the Double. In both cases the cutters are actuated by spring carried by a tee or a rod. The North has a solid tee-head to which the cutters are attached. The North cutters have slots in the backs of their shanks in which the tee-heads operate and which are large enough to permit the cutters to tilt. The cutters of the North underreamer contract when drawn downwardly on the spring actuated means and expand when drawn upwardly. The Kellerman underreamer covered by patent No. 679,384 consists of a body with an inter-

(Testimony of William W. Wilson.)

nal bore to receive a spring and a spring actuated rod. The main movement of the cutters of this reamer is not to travel with respect to the body vertically, but were pivoted on a key. The expansion or contraction of the cutters is accomplished by a spring drawing the tapered wedge C-4 up between the cutters or withdrawing it from between the cutters. To withdraw the Kellerman reamer it is necessary to force the spreading wedge downward between the cutters which was done by a device which contracted with the casing as the reamer was drawn into the casing from the lower end.

The Mack underreamer No. 496,317, consists of a body with suitable means of attaching to a string of tools, the body being bifurcated, extending downward in narrow portions which portions are flexible and terminate at their lower ends in cutting parts. These two legs or bifurcated parts or cutters are expanded by [224] means of a spring actuated device interposed between the cutters. The cutters have grooves or pockets at their backs, by which means the cutters are allowed to contract or expand over spreading bearings. In this regard they resemble the Double underreamer cutter.

The Palm Patent No. 563,054 covers the casing spear and has slips that travel on an inclined way, or actuated by a rod with key extending through a slot.

The Mentry underreamer covered by patent No. 647,605 consists of a body composed of two pieces threaded together. Has cutters which operate on

(Testimony of William W. Wilson.)

dovetail slip ways, spring actuated. The cutter ways are downwardly and inwardly inclined, and the cutters collapse on a downward movement or expand when withdrawn upwardly in their dovetail slip ways.

There are many underreamers covered by U. S. Patents, such as the Lloyd Patent, the Hobart & Ahern, Diesch, York, Allen and the Duncan, all of or most of which have cutters which were spring actuated and which were expanded by vertical travel or collapsed by vertical travel in their cutter ways. Many of these had spreading bearings interposed between the cutters corresponding to the Double hollow slotted extension and the cutters were collapsed over the spreading bearing.

My understanding of a slot is an elongated hole in some material. In mechanics, either a long narrow groove or channel, or a comparatively long and narrow depression or cavity, cut in a piece of metal to receive some corresponding part in the mechanism, is known as a slot; also an oblong hole or aperture formed through the entire thickness of a piece of metal is known in mechanics as a slot. I do not consider the opening from one part to another of the Wilson underreamer body between the prongs to be a slot, for the reason that it is open into space. It would be called a notch more particularly. My understanding that the word "slot" implies a hole having four walls—[225] two sides and two ends. If such an opening is opened at one end it becomes a notch.

The purpose of the coacting dovetails on the cut-

(Testimony of William W. Wilson.)

ters of the Wilson reamer and the ways or ribs of the body portion is to limit the outward movement of the cutters; without these the cutters might slip outwardly, allowing them to come off the end of the T-rod. Without these dovetails the Wilson reamer would be operative, but it might not be safe. In some formations it would not be safe, in [226] some it would. I assist in the management of the defendant company, having charge of the offices; also designing apparatus and conducting sales; also overseeing the manufacturing work.

As I stated before in my direct testimony, the cutters of the Wilson underreamer is pivoted on a line which is at the intersection of the plane of the outer faces of the dovetailed ways, and the planes of the bevels formed at the upper end of those dovetailed ways. The object in making the keyseats in the cutters somewhat larger than lugs on the tee-rod is to provide the tilting action for the cutters. In other words, to provide the tilting action for the cutters on the tee.

Testimony of J. M. Kellerman, for Defendant.

J. M. KELLERMAN deposes and testifies as follows:

My name is J. M. Kellerman; age, 52; resident of Los Angeles, California. I am an oil operator. I have been in the business thirty-five years in all lines. Have operated in Pennsylvania, Wyoming, Idaho and California. I have operated in practically all of the fields of California. I arrived in California

(Testimony of J. M. Kellerman.)

in 1882 and oil was produced in this State before that time. For ten or twelve years oil was produced in the Pico Canyon prior to that time. Extra heavy casing came into use in about 1902. It was much better for deep drilling. The light casing would stand only about so much water pressure and the heavy casing was much preferred to go deep. The calf wheels would also pull the light casing in two. About 1902 was the first wire line. At that time I used the first wire lines; had used manilla lines before that. Wire lines were much better for deep wells. Calf wheels were first used in about 1900. I had the first calf wheel built that was ever built and I used it on the Santa Susana Ranch for the Union Oil Company. I first suggested the use of the calf wheel. It would be impossible to drill a well [227] in California to-day without the calf wheel or something to take its place. For instance, we would have 4,000 feet of line in and we would have to take it off the bull wheel every time we moved the casing if we were not running our calf wheels, and lots of times would have to move it every thirty minutes, which would simply be impossible. If we were using simply bull wheels and having no calf wheel in the rig, it would simply be impossible to drill in the California fields—we would be doing nothing but putting on and taking off the line. The drilling line is on the bull wheel, and in order to move your casing you would have to run it off that and put on your casing line which is a block and tackle. That is the way we would shift that casing before we had the calf wheels;

(Testimony of J. M. Kellerman.)

consequently we could not drill so deep. My first experience with underreamers in well drilling was that I have seen the time when I would give a thousand dollars for one for five hours. I believe the first reamer that they used in California was the Austrian reamer. That was in about 1898.

We used it at times to knock off lumps or boulders that might stick out in the hole. We didn't use to ream a hole all the way and ream it all like we do to-day; just occasionally we would run it. It did such work. Sometimes it was a pretty hard struggle to get it to do it. We used it on different wells in the Los Angeles field, possibly five or six wells; known other people to use it but can't say how often. I don't believe I have seen an Austrian reamer for ten years. Yes, we lowered the casing after using it; but we might have to try it several times before the casing would go down.

About that time I got up an underreamer myself which worked pretty well, it was about 1900. The reamer was about ten feet long. The jars and the cutters were extended by means of a wedge which operated between the cutters. I had that reamer patented. Patent No. 679,384. I used the reamers on the railroad company's property on Ocean View Avenue, Los Angeles. It worked, but not [228] very satisfactory, but it reamed the hard places and let the casing down. Probably reamed eight or ten wells with it. Reamers I had made in 1901 I ran in the Los Angeles fields—also in Santa Barbara County. Also used them in Newport.

(Testimony of J. M. Kellerman.)

The Union Tool Company made a dozen of those at one time for me; but that special dozen was not what I wanted it, and I changed it. That dozen were just like the drawing in "Defendant's Exhibit Kellerman Patent." Double's company, the Union Oil Tool Company made them on contract. I tried to use one of them, and then remodeled them. Practically wore them out myself, reaming different wells with them at Castaic, King City, Newport and Cat Canyon. After I remodeled them, I considered they worked first class. I remodeled them in 1902, about that time. When the Union made them for me. The trouble with the first reamer I made was getting it out of the hole. The construction of it was bad, I suppose. I don't know what you would call it hardly. It would be the slides that pulled the wedge out would not work satisfactorily; sometimes get stuck and I would have to pull the pipe out of the well in order to get the reamer out. The slip device made by the Union Tool Company was the portion I had remodeled. That was as late as 1910 I used those reamers. I used them for several years for my own work. I was always able to lower casing after using my own reamers. I drilled some holes as deep as 2,900 feet. The only trouble I had with that reamer was getting it out of the casing. The slides or slip device would sometimes get stuck and I would have to pull the pipe to get it out of the hole. I have had the same trouble with Double and Wilson reamers. I have used the Swan underreamers on one occasion, in 1903 or '04, possibly on the Cottage

(Testimony of J. M. Kellerman.)

Home Tract in Los Angeles. It did the work very satisfactorily. It enabled me to lower the casing. But it was a shallow well—you might call it a post-hole—twelve or thirteen hundred feet—but what I had to do, it done the work [229] and enabled us to lower the casing. I never used the Swan or Leidecker reamer except that one time. I couldn't say but what that was the first Swan reamer I ever saw. I have never seen one in the California fields. I have used the Austrian reamers and have been successful in getting off the lump or boulder or whatever it might be and getting the casing down, but it is a long tedious job.

I have seen the Plotts reamer which is very much like the Austrian reamer. I have used both types of Double underreamers. Reamed with the old style and the Double improved. I have also used the Wilson underreamers. I am now using Wilson underreamers. I used about the first Double reamer that was ever turned out on the Dietz Ranch, when their shop was still in Santa Paula. It must have been in about 1902. Possibly 1903. I had good luck with both Double and Wilson reamers. I have lost jaws or cutters off both of them. When I lost Wilson underreamer cutters I do not know whether there was a safety bolt in the Wilson underreamers or not. Determining the relative benefit of different improvement in well-drilling devices will say, that the calf wheel, the underreamer and heavy casing all play an equally important part. It would be impossible to drill wells without either one of them

(Testimony of J. M. Kellerman.)

to-day at the depth we are now drilling. The trip device of the Kellerman underreamer as used to-day is very different from the one I formerly made. I used a trip with a piece of casing, now I trip with a device which contacts with the lower end of the shoe when I draw in the casing. The trip that Mr. Double put in was designed by myself. I have never endeavored to sell any of our underreamers. I am familiar with the O'Donnell and Willard underreamers. During the years 1898, 1899 and 1900 and 1901, there was a strong demand for a successful underreamer.

It was during those times that I saw the time I would have given a thousand dollars for a satisfactory underreamer. It was [230] during any time from 1897 to 1900. I have seen it often. It was before I had used the Austrian.

Q. 199. Then, if I understand you correctly, based upon your experience and knowledge of the Austrian reamer, it at best was merely a makeshift tool to knock off—

A. Shale, lumps, rocks or any interruptions.

Q. 200. You never did any real underreaming, then, with the Austrian reamer?

A. Just as I stated, a bunch might happen to be left on the shell, but I never met any obstructions which it would not knock off and clear the way for the casing.

**Testimony of W. W. Wilson, for Defendant
(Continued).**

The strength of the Wilson cutter is improved or greatly increased by reason of the opening or open notch-way in which the shanks of the cutters extend. It facilitates ease of machining the Wilson underreamer body. Open spaces for cutters are old. In my opinion the Wilson underreamer could be made with the cutters operative and leave solid metal the entire circumference of the body at the lower end. Such an underreamer could be designed eliminating the spreading bearing for the cutter as shown in the Willard underreamer, the Swan underreamer and also in the Double underreamer. The cutter would have a pivoting action instead of a teetering action as in those other reamers.

In the Wilson reamer there are spreading surfaces on the lower ends of the prongs. The bits co-act with these inclined surfaces and the upward movement of these bits on these inclined surfaces swing or tilt or cause pivotal action, whichever you wish to term it, of the cutters on the spring actuated rod. After the bits have passed beyond these inclined surfaces, which may be termed "spreading surfaces," the same portions of the bits ride up on further spreading bearings. The primary function of these further spreading bearings is to take the in-thrust of the bits when underreaming. The body portion of the Wilson reamer is sufficient [231] to allow room for the spring and the spring-actuated rod. The shoulders or spreading surfaces of

(Testimony of W. W. Wilson.)

the bits are projected along the faces at the outer edges of the sidewise extension of the cutters. These faces are turned in toward the center of the body but are not the innermost faces of the cutters. There is no other contacting face of the cutter which is further in than these shoulders or surfaces to which we have last referred except the upper end of the shank which bears against the block or T-bar when the cutters are in expanded position, maintaining the upper ends of the cutter shanks in proper position and directing the motion of the cutter in expanding. The upper ends of the shanks of the bits in the Wilson reamers bear outwardly against the dovetails or ribs, and inwardly against the block (in Complainants' Exhibit Wilson Reamer) or T-bar (in Complainants' Exhibit Wilson Underreamer No. 2) according to the strain that may be on the cutters when in action, or strain put on the cutters in collapsing or expanding. The upper ends of the shanks of the cutters do not necessarily bear against the dovetails or shoulders, or the block or T-bar. There is lost motion there to prevent binding. There is only very slight movement of the upper ends of the shanks away from their bearing on the block or T-bar during the callapsion of the bits. The main movement is down along the block. There is some movement of the upper end of the shank outward or T-head. The point above the pivot moves slightly outward. That is a mere incident in the action of the Wilson cutter. The shoulders or spreading surfaces of the Wilson cutters face toward the inner side of the cut-

(Testimony of W. W. Wilson.)

ter. They are the inner faces, recessed faces. When I said that these faces were not projected toward the inside of the cutter I mean that they are on a shoulder or projection from the inner face of the cutter, as is the riding surfaces of the Double underreamer.

Q. 194. Why do you say that these surfaces are not projected inwardly?

A. Because, considering the body of the metal in which these [232] shoulders are placed, they are in the actual machine operations cut from the metal which extends further in, and lie on either side and outward from the central portion of the cutter at that point.

Q. 195. Now, Mr. Wilson, let us change your viewpoint then and consider the Wilson cutters not from their mode of manufacture, but the cutters as they actually exist in the Wilson reamers and are here before us. Will you still say that these spreading-shoulders and surfaces are not projected inwardly?

A. I can see no inward projection on which they rest.

Q. 196. What purposes do the surfaces 4³ of the Wilson underreamer, referring to "Defendant's Exhibit Wilson Patent 827,595," subserve?

A. They are for the cutters to bear against to retain them in outward expanded position when the cutters are expanded.

Q. 197. And the shoulder at the top of these surfaces 4³ cause the tilting or pivotal action of the cutters, do they not?

(Testimony of W. W. Wilson.)

A. The upper edge of that shoulder causes expansion.

Q. 198. The upper and inner edge? Is that correct?

A. The surfaces 4³. It is only the upper. It could not be the inner.

Q. 199. Well, it is the inner portion of this shoulder, which shoulder is above the surfaces 4³ that causes the tilting action of the Wilson cutters, is it not? A. Yes, sir.

Q. 200. Referring now to "Complainants' Exhibit Double Patent," what purposes do the surfaces, 18, on the bits serve?

A. So they can take the inner thrust of the cutters at the lower end when reaming.

Q. 201. And what do the shoulders 26 do?

A. They allow space for the cutter to collapse over the partition or extension 6.

Q. 202. Is that their primary purpose? (Referring to faces 26 of [233] the Double patent.)

A. Yes, sir. Without that face there could be no pocket, and, consequently, no collapsible action of the cutter.

In the Wilson reamer the shanks of the bits are rigidly held throughout their length when the bits are in expanded position, as set forth in lines 71-72, of column 2, of page 2, "Defendants' Exhibit Wilson Patent," being in contact throughout the length of the cutter shank with the ridges or dovetail on the inner faces of the prongs. The pressure of the upper spreading bearings on the lower ends of the

(Testimony of W. W. Wilson.)

prongs against the coacting faces on the cutter and also the block or T-head at the top against the upper ends of the cutter, hold these cutters in such rigid contact or interengagement with these dovetails.

The lugs or projections at the lower ends of the prongs of the Wilson underreamer bodies are provided with two faces, that is, each face upon which the cutters rest when expanding or when in reaming position are spreading faces as they are angular and tapered. This differs from the Double as with the Double underreamer it has only one spreading face for each cutter, the inner thrust bearing being parallel is in no wise an expansion bearing. While the bearings at the backs of the Wilson underreamer cutters are in a sense inner faces, their position is different from the Double underreamer cutters as they are not the innermost face of the backs of the Wilson cutters. That is the case, however, with the Double underreamer cutters. The shoulders at the back of the Wilson underreamer cutters are not projected shoulders as is the case with the Double underreamer. They are recesses in the backs of the cutters and do not extend even as far as the back edges of the cutters and cannot be called a projecting shoulder as is the case with the Double reamer cutter.

The retaining bolt or safety bolt of the Wilson underreamer is solely for the purpose of preventing loss of Wilson underreamer cutters. The pipe placed over the tee-rod of the Wilson Underreamer Complainant's Exhibit, is for the purpose of [234]

(Testimony of W. W. Wilson.)

limiting the downward travel of the cutters when collapsing. Such a device could not be used on the Double underreamer as there is not room enough to do so; it would be necessary to drill a larger hole to admit the pipe and the spring. This would weaken the middle joint still more than the present condition.

The metal in the central partition between the portion upon which the upper face of the Double bits bear when in expanded position, and the thrust bearing below the dovetails of the body, in the Double reamers serves the purpose of directing the rod at its lower end; it also serves to keep the cutter shanks from tilting inwardly at any stage of the contraction or expansion; and further, the old idea of preventing the sand in the well from interfering with the action of the reamer requires all space to be filled as much as possible with metal. Cutting out this metal from the Double reamer might interfere with the action of the reamer. I am not certain; I am not clearly posted on the Double reamer. It would not change the mode of operation of the inter-related parts in any manner to remove the metal referred to unless it might allow other actions of the cutters to come into play; the cutter might tilt in at that point; also, the mandrel would be liable to become displaced so as not to properly enter the hole in the lower portion of the metal. Cutting out this portion of the metal would not render the Double reamer inoperative. However, it would be liable to more objections than it now has by this action.

(Testimony of W. W. Wilson.)

This differs from the open chamber of the Wilson.

Q. 245. In what respect would it be different in that regard than the open chamber for the rod in the Wilson reamer?

A. The Wilson T-bar, being integral at its lower end, has no need of an extension of the mandrel-rod below the key, as is in the Double reamer; and, further, the peculiar tilting of the cutters that is necessary in the Double underreamer may cause actions that would not come into play in the Wilson underreamer. It is necessary in the Double underreamer that the cutters be allowed to [235] play outward and inward on the T-rod, and this action is particularly noted when the cutters are running up and down the casing, at which point the metal which might be removed as shown in the complainants' attorney's questions, comes into play to maintain the cutters, the shanks, in their outward expanded position, which if removed, might allow them to tilt outwards on running down the casing, causing them to stick.

The Austrian underreamer body has slots machined through it in which the cutters or bits are mounted. Each bit is mounted on a pin which passes through a hole in the body, and through a hole in the bit. The upper horizontal faces of the bits when in expanded position contact with shoulders at the top of the pockets in which the bits are mounted.

The only difference between that and the Wilson underreamer is that the cutters swing through a

(Testimony of W. W. Wilson.)

larger angle to expanded position than with the Wilson.

The mode of operation of the bits in the Austrian reamer and the Wilson reamer are dissimilar, however, the means of protecting them are virtually the same. There is no longitudinal movement of the dogs or bits of the Austrian reamer in the body of the Austrian reamer. Their action is solely pivotal. In the Wilson reamer, the actions are similar in that both are pivotal. The bits also have a longitudinal movement in the body. The amount of longitudinal or sliding movement of the Wilson cutters or bits depends upon the length and angle of the spreading bearings.

Q. 267. And in this respect the Double and Wilson underreamers both differ from the Austrian?

A. In this respect the Wilson reamer differs from the Austrian. However, the Double underreamer differs from the Austrian in having this action combined with the tapered dovetail-ways action to give additional expansion.

Q. 268. Explain what you mean in your last answer by tapered [236] dovetail-way action of the Double reamer.

A. The dovetail ways of the Double reamer body, as I have explained, taper inwardly at their upper ends, so that the cutter dovetails on traveling upward cause the upper end of the cutters to be drawn together, which acting over the fulcrum, at the center of the cutter, causes the cutting edges to be thrown further outward.

(Testimony of W. W. Wilson.)

Q. 269. At what point in the Double underreamer, either "Complainants' Exhibit Double Underreamer" or "Defendant's Exhibit Double Underreamer," or in the drawing of "Complainants' Exhibit Double Patent," do the dovetails on Double bits contact with the dovetails for the action that you have last referred to?

A. Throughout their travel up and down.

Q. 270. The whole length of the dovetails?

A. No, the upper ends of the dovetail ways on the cutters bear against the insides of the dovetail ways—or, against the outsides of the dovetail ways, rather—throughout the travel of the cutter.

Q. 271. And do not the upper ends of the dovetails on the cutters of the Wilson reamer similarly bear against the dovetails on the body of the reamer?

A. They do. However, the dovetails on the Wilson body or ridges being parallel, this can give no additional expansion.

Q. 281. In your answer to question 15, in speaking of the strain taking place on one side of the cutter, due to one edge of the cutter only striking upon a ledge in underreaming, you say that the blow would come on one point at one side of the cutter and on the diametrically opposite point of the other cutter. Where is this strain thrown onto the body of the reamer?

A. In which underreamer?

Q. 282. In the Double reamer, first.

A. The pressure is primarily up and also diametrically inward [237] on this point of the cut-

(Testimony of W. W. Wilson.)

ter. That throws a strain on the outer edge on the same side of the cutter of the spreading bearing on the body; also an outward pressure on the upper ends of the dovetails of the body; also an upward pressure of the cutter against the upper thrust-bearing of the body, as shown in the case of the "Complainants' Exhibit Double Underreamer." In the "Defendant's Exhibit Double Underreamer," to begin with, it is noted that by putting a straight edge on the inner-bearing face of either of the cutters, that that face has become rounded. In this underreamer, when such a strain is applied to the point of the cutter, similar stress is thrown on the cutter upward and diametrically inward, the upward stresses causing pressure of the cutter-shank against the upper thrust-bearing upon the body, the diametrically inward pressure causing pressure inward on the thrust-bearing at the lower end of the partition of the body and outward stress of the cutter dovetails against the dovetails of the body on the side opposite from the cutter to the point where the pressure is applied.

Q. 283. And the tendency, then, of such a blow in the underreaming is to rip the cutter out sideways of the body of the reamer, is it not?

A. Yes, sir.

Q. 284. And this tendency is resisted by the wall of the slot or notch?

A. No, the pressure is taken up by pressure inward against the thrust-bearing on the lower end of the partition, and, like a lever action, the other part

(Testimony of W. W. Wilson.)

of it is taken against outward pressure on the dovetails of the body at the other side.

Q. 285. The tendency is to rip out the dovetails, then, in this action? A. Yes, sir.

Q. 286. And the dovetailing is a brace against this tendency? A. Yes, sir. [238]

Q. 287. In a similar strain upon the Wilson reamer, the same tendency is counteracted by the dovetails, is it not?

A. No, the spreading-bearings being placed out under the extreme edges of the cutter, any diametral-thrust pressure on the corner of the cutter would cause pressure inward on that upper spreading face on the prong, which is reacted against by the pressure outward of the cutter-shank against the dovetails clear up the body—clear up the length of the cutter.

Q. 288. And the tendency is to rip out the dovetails, is it not?

A. No, that is the advantage of having the spreading-bearings wide apart on the edges, because this prevents throwing a heavy strain on the dovetails at the body at the lower portion.

Q. 289. You mean to say that there is no tendency in that action of the shank of the cutter to move outward, which tendency is counteracted by the dovetails?

A. Yes, there is a tendency of the cutter-shank to move outward. However, this action tends to move the entire cutter-shank outward.

Q. 290. And that tendency is counteracted by the dovetails?

(Testimony of W. W. Wilson.)

A. Dovetail in full length of the cutter-shank. Also the strain on the cutter-shank is much further away from the fulcrum on the spreading-bearing than the point of application of the pressure to the cutter is from the fulcrum; consequently, it has great leverage.

The Wilson underreamer cutters, being at the extreme outer edges of the body, by coacting with the extended bearings on the prongs of the underreamer are better braced, and thus less strain is applied to the dovetails, than is the case with the Double underreamer.

A. 294. I cannot see but mechanically there are two separate thrust-bearings acting on each cutter in the Wilson reamer, and in the Double reamer, particularly in "Defendant's Exhibit Double Underreamer" there is one thrust-bearing acting upon each cutter. [239] It is as though I placed a board resting on two tables, each placed at its end; or, if I rest the board on one table, the table placed at its middle.

Q. 295. You understand both the purpose and object of the question that I just asked you, and the suggested change in size of the parts, do you not?

A. Yes, sir, I think I do.

Q. 296. Well, will you please answer the question?

A. If the two bearings, one operating on each cutter, which are on each prong, were placed closer together, the strains on the cutter would be the same as they are at present constructed. The advantage in cutter action is gained by placing the two spread-

(Testimony of W. W. Wilson.)

ing surfaces, which act on one cutter, far apart, rather than centrally locating with respect to the back of the cutter.

Q. 297. What, then, do you understand to be the reason for using the open slot and the dovetails for the shanks of the cutters in the Wilson reamer?

A. I take it you mean the forked lower extension of the Wilson body. As previously stated, it is for the purpose of placing the thrust-bearings against the cutters wide apart on the cutter-backs as well as allowing room for the cutters to operate, so that they may collapse completely together without having any portion of the body interpose between them, therefore requiring no arrangement of the inner faces of the cutters, such as a notch or cut-out space in the backs to allow for contraction. Also, it allows the entire operating mechanism to be placed or withdrawn from the underreamer body through the lower end, thus avoiding the middle joint. Also it allows the underreamer body, when worn, to be machined back a distance to cut the old bottom bolt holes out of the body; and in this manner give entire new wearing surfaces to the action of the reamer; this being particularly shown in "Complainants' Exhibit Wilson Underreamer," where the reamer has been remachined, the bottom bolt hole having been cut off. The [240] groove above that hole for the placement of the cutter-pin alone remaining on one end of one prong. The old screw-holes were plugged up, as shown just below the new and present used screw holes. So the reamer body is reclaimed in a way

(Testimony of W. W. Wilson.)

that is as good as new. This cannot be done with the Double underreamer, because it would have to be machined back sufficient distance to allow the placing of the lower portion of the body extending below the bottom of the slot, a sufficient distance above the top of that slot to give these new wearing surfaces as before, and this would carry the pockets for the cutters to slide in up above the counter-bored portion of the underreamer body, and consequently weaken these parts; also new means would have to be devised to support the spring, or longer spring used.

Q. 298. I will ask the Special Examiner to read the question to the witness and ask the witness to answer the question. (Question No. 297 read.)

A. I am trying to answer the question as I understand it.

Q. 299. In the operation of the Wilson underreamer as an underreamer, what, then, is the reason for using the inner engaging dovetails of the body portion and bits?

A. The reason for using the dovetails on the bits and the co-acting shoulders on the extension of the body, is for the purpose of preventing outward movement of the cutter-shanks beyond certain limits.

Q. 300. When is there any tendency towards such outer movement?

A. I have shown a tendency towards an outer movement in the previous answer, wherein a blow should be struck at one corner; also in the brittle formations, where the rock being underreamed

(Testimony of W. W. Wilson.)

breaks off, leaving the shell or ridge between the drilled hole and the underreamed hole, forms in an upwardly expanding funnel shape, there is a constant tendency to draw the lower points of the cutters inward, which throws an outward strain [241] on the upper shank of the cutters, which is held by the ridges on the inner sides of the forks of the extension.

The object of the forked lower extension of the Wilson underreamer body is to provide these wide bearings and also to permit the cutters to collapse completely together without having any portion of the body interposed between them, thus dispensing with the use of the notch found in the Double underreamer cutter which weakens the Double reamer cutter, and it also avoids the necessity for the middle joint in the reamer body, as the cutters and reamer are assembled at the bottom.

Q. 301. Referring now to "Defendant's Exhibit Swan Patent 683,352," do you consider the mode of operation in said Swan patent of the parts in contraction or collapsion of the cutters or bits the same as either the mode of operation of the Double reamer of "Complainants' Exhibit Double Patent" or of the Wilson reamer of either of the complainants' exhibits?

A. I believe I have stated in my answer to the comparison of the Swan underreamer and the Double underreamer, that the action of the contracting the cutters of the Swan patent by sliding down inwardly inclined dovetails, had a counterpart in the

(Testimony of W. W. Wilson.)

Double underreamer as disclosed in the patent and the exhibits, in the outwardly tapering dovetail ways shown in those underreamers and patents, in that the cutter on sliding along tapered dovetail ways caused contraction. In the Double underreamer, the taper of the dovetails is reversed from that of the Swan, due to the fact that the action of the dovetail of the tapered dovetail ways of the Double underreamer is applied to a point on the cutter which is on the opposite side of a fulcrum about which swings the cutter, which fulcrum action reverses the direction which the dovetails must be tapered. In the Swan, however, no such fulcrum being present, the dovetail ways acting directly on the points of the cutters, the dovetail ways are tapered inwardly and downwardly, which is the reverse of [242] the tapering of the dovetail ways in the Double underreamer patent and in the Double underreamer, "Complainants' Exhibit Double Underreamer" and "Defendant's Exhibit Double Underreamer."

Q. 302. Then are we to understand from your last answer that you consider the mode of operation of the Double cutters in expanding and contracting the same as the mode of operation set forth in said Swan patent?

A. Not altogether the same, the Double underreamer cutters having also expanding action by being slid over stationary spreading-means on the lower end of the extension in the expanding.

Q. 303. Would the Double bits expand in any manner if it were not for the spreading surfaces of

(Testimony of W. W. Wilson.)

the bits riding on the inclined surfaces of the expansion-bearings of the Double reamer?

A. Yes, if the expanding-bearing was taken clear out from the Double underreamer, leaving only the dovetails, the cutters could be collapsed so that their backs rested against each other and then sliding upward, the shanks of the cutters riding in tapered dovetail ways, would cause expansion of the points of the cutters, which lie below the points where the cutters would bear together.

Q. 304. For that reason, you say that the mode of operation or of expansion of the device of the said Swan patent, and of the Double underreamer, are practically the same, do you?

A. In that one respect they are practically the same.

Q. 305. You disregard, then, the fact that the Double underreamer cutters have a tilting action and no tilting whatever is possible of the Swan cutters, do you?

A. No, I believe I have stated that that tilting action is an additional action in the Double cutters, and the expansion is due to, (a) a tilting action of the cutters over the spreading-bearing, and, (b) to the incline of the tapered dovetail ways.

Q. 306. Do you consider the mode of operation of the device set [243] forth in "Defendant's Exhibit North Patent 674,793," the same as the mode of operation of the Double reamer of "Complainants' Exhibit Double Reamer"?

A. The expansion of the North underreamer is

(Testimony of W. W. Wilson.)

caused by drawing the upper ends of the cutters together by sliding in upwardly in the tapered cutter pocket, the cutters being fulcrumed against each other near their center, causing the cutting edges to be thrown outward. This same action I have described in the Double underreamer as being due to the tapered dovetail ways in the body, in my answer to your question on the Swan underreamer.

Q. 307. Will you now please answer the question just asked yes or no?

A. Read the question. (Question No. 306 read.) No, not identically the same.

Q. 308. That is, are they substantially the same?

A. No, only partially.

Q. 309. Do you consider the mode of operation of the expansion and contraction of the bits in "Defendant's Exhibit Kellerman Patent 679,384," the same or substantially the same as the mode of operation in the contracting and expanding the bits in "Complainants' Exhibit Double Patent" or Double underreamer?

A. Substantially the same, yes, sir.

Q. 313. (By Mr. BLAKESLEE.) Well, then, to bring it right down to the facts, or to establish what we still contend are the true facts, let us refer, first, to the "Complainants' Exhibit Double Patent" in suit, and I will ask you how the spreading action would be produced with the construction shown in this patent, if the "downward extension 6" were removed.

A. The expansion of the cutters would be only

(Testimony of W. W. Wilson.)

small, due to their travel in the tapered dovetail ways.

Q. 314. Again, supposing such elimination of metal, please state what contribution to the spreading-action of the cutters would be [244] made by the faces, 26, of the cutters and the shoulders between the faces, 26, of the cutters, and the projections, 18, of the cutters.

A. There would be no expansion caused by these parts.

Testimony of Edward L. Mills, for Defendant.

EDWARD L. MILLS deposes and testifies as follows:

My name is Edward L. Mills; occupation, proprietor of the Mills Iron Works; residence, Los Angeles, California; age, 44. I am a manufacturer of oil well tools. I have been in that business since the year 1888. I have manufactured underreamers. The first underreamers I manufactured were the Austrian underreamers. That was in about 1896. That was in Bradford, Pennsylvania. It was in the shop of the Bovard and Sefang Manufacturing Company. I don't suppose I made half a dozen. Also made about half a dozen of Russian underreamers at the same place. It was a foreign shipment.

While with the Baker Iron Works of this City that Company made Austrian underreamers, also made some underreamers for a man by the name of Swan. That was from 1900 to 1902. I presume we made twenty-five or thirty Austrian underreamers. A good many of them were sold. I have heard of

(Testimony of Edward L. Mills.)

the Wilson reamer, and also the Double reamer and am familiar with both. Saw Double reamer in probably the year 1900 when I first came to Los Angeles. The first ones were the type, "Defendant's Exhibit Double Reamer." I believe the Wilson underreamer is the stronger reamer of the two. The cutters of the Wilson underreamer are stronger because the stock in the center of the cutter is not all removed to allow the cutter, to close down over the end of the reamer.

A. 64. Well, in the Wilson—the shank on the Wilson cutter is not provided with any pocket to allow the cutter to close down over the mandrel. That stock being left in that cutter makes the cutter [245] very much stronger than the Double underreamer cutter, which is cut away to allow the cutters to contract down over the spreading-bar of the underreamer.

Q. 65. Will you kindly point out the pocket to which you have just referred?

A. This pocket right here. (Witness designates in a cutter of Defendant's Exhibit Double Underreamer the space directly above and formed by the production of the face 26 of Complainants' Exhibit Double Patent.)

Also the bar that holds the cutters is stronger. The Wilson underreamer will in my opinion last longer than the Double because the spreading bars at the end of the reamer are made tapered so that the cutters will relieve themselves in case of getting stuck in the hole or formation in which the reamer

(Testimony of Edward L. Mills.)

is being used. The Double cutters are slotted entirely through to permit the key, while the Wilson reamer cutters are machined only part way through. With the solid forged tee-bolt of the Wilson reamer in the event one lug would break off only one cutter could be lost, whereas in the Double both cutters would be lost. I have seen Double underreamer cutters broken through the shanks. By examining this broken Double reamer cutter I cannot tell in any way whether it has ever been tempered. It may have been tempered and may have been annealed a dozen times, for all I know.

A. 90. From the appearance of the metal in the broken cutter it does not show any evidence of containing any flaws or inherent defects.

Q. 91. (By Mr. BLAKESLEE.) Now, assuming that this piece of cutter shank-like metal had been tempered just last prior to its breakage, will you please state whether, so far as you are informed about such matters, such tempering would be evident now subject to the test you have made.

Mr. LYON.—Same objection as last noted. [246]

A. I think that if the broken piece of cutter or the cutter from which that came, had been tempered, it would certainly show evidence of being tempered.

Q. 92. (By Mr. BLAKESLEE.) During your experience in Los Angeles have you ever repaired any Double underreamers or parts thereof?

A. Yes, sir.

Q. 93. In what respects among others?

A. I have repaired the body of the underreamer

(Testimony of Edward L. Mills.)

in use at the end or spreading portion, which becomes worn, from the cutter sliding up and down, and usually plane them off and set pieces on the end.

Q. 94. Any other respects?

A. I made new spring-bolts for them, repaired the springs, made new keys in a number of instances.

Q. 95. Have you ever done anything on the cutters of the Double underreamer during that time?

A. Only dressing them; dressing them and repairing them.

Q. 96. Repairing them in what respect?

A. Well, sometimes in running the reamer the cutters will bend through that weak portion where the pocket is planed in; have to be straightened up.

Q. 97. Please point out the portion you refer to on the cutter of "Defendant's Exhibit Double Cutter."

A. Bend through; either bend or break. (Witness refers to the portion of the shank just above the face corresponding to the face 26 of "Complainants' Exhibit Double Patent.")

I have never repaired a Wilson underreamer. I have never seen a broken Wilson cutter. I arrived in Los Angeles I think the fall of 1900. Went to work at the Baker Iron Works at once. I think it was about November 1st. Worked for them about a year and six months.

I have absolutely no animosity against Edward Double or the Union Tool Company. He and I are very good friends so far as [247] I am concerned.

I have no animosity against Mr. Lyon. At first I

(Testimony of Edward L. Mills.)

thought Edward Double in bringing me into that Interference case was trying to do me an injury—however, I think it was a benefit to me the way it turned out.

A general description of the Swan underreamer, or rather an underreamer made for the man by the name of Swan while at the Baker Iron Works in this City; the body contained a pin at the top and a sharpened projection at the bottom end to serve as a bit and a slot in the body of the reamer to receive the cutters.

There was a pin fastened through the cutters to hold them in the body of the reamer. The cutters were held apart by a spreading block contained at the lower portion of the reamer body. The reamer was covered by Patent No. 683,352 was not the same make or style. At one time I manufactured reamers known as the "Mills" or "National" reamers. That reamer used a tee-rod which was spring-actuated and which carried the bit and the head or wings or key of the rods were made integral with the ends of the rods and that rod was slipped into the reamer from the bottom. I used the open slotted sides of the lower extension of the mandrel for the backs of the cutters to project through. It had no interengaging dovetails on the walls of the slots and cutters. That reamer had no integral partition extending from the top of the side slots and between the side slots clear down to the end of the reamer. The bore was an open chamber at that point.

Q. 147. In the reamer as manufactured by you

(Testimony of Edward L. Mills.)

there was no integral partition extending from the top of these side slots and between the side slots clear down to the end of the reamer? A. No.

Q. 148. The bore was an open chamber at that point?

A. Yes, an open chamber with the exception of the space at the bottom of the body of the reamer that the spreading block was inserted and fastened in. [248]

Q. 149. And in order to form the spreading block you screwed that spreading block onto the end of the slotted body and used the screw threads and pins to hold the block in place?

A. No, sir. That spreading block was inserted in the bottom of the reamer, and there was a hole drilled through it in the sides of the reamer to insert a pin; no screw threads about it.

The spreading surfaces were substantially the same as "Complainants' Exhibit Double Reamer."

The action of the cutters in tilting was the same as "Complainant's Exhibit Double Reamer" and "Complainant's Exhibit Wilson Reamer," that spreading action being essentially the same in all these reamers. Those reamers did satisfactory work, were apparently satisfactory. I never got any of them back. There was an interference suit filed by Mr. Double in regard to my application for a patent on that reamer.

The Double patent 796,197 dated Aug. 1, 1905, issued on an application filed Dec. 18, 1902, shows the drawings, specifications and claims on the Double application involved in the interference in the Patent

(Testimony of Edward L. Mills.)

Office with the patent application of this witness on the underreamer referred to by him as the Mills or National underreamer. Said reamer was adjudged by this Court to be an infringement of the Double patent 796,197 offered in evidence.

**Testimony of E. C. Wilson, for Defendant
(Recalled).**

Direct Examination Resumed.

I will explain that the "Defendant's Exhibit Broken Cutter Shank Parts," was brought to the shop of the Wilson-Willard Mfg. Company by two men engaged in the oil business. One of them produced this piece of broken cutter and said that they were looking for an underreamer that does not cause the trouble as this caused us. That was the manner in which I got possession [249] of this piece of cutter. It is the upper shank or portion of shank of the Double underreamer cutter, Complainants' Exhibit Double Reamer.

Such broken pieces of Double cutters are common sights in the oil field shops. (599) W. W. Wilson brought in to our shop the lower half of the Double underreamer body with both of the cutters broken in two at the slot. That was two or three weeks ago. (600)

Mr. LYON.—We object to the answer so far given by this witness, and particularly the alleged conversation, as being incompetent, hearsay; not the best evidence; it not being shown to have taken place in connection with complainants or any of their

(Testimony of E. C. Wilson.)

officers; and move to strike the answer from the record and exclude it from consideration upon the grounds stated; and object to the witness further detailing any of such conversation on the same grounds; and protest against the lumbering of the record with such incompetent and hearsay matter. If the witness has any personal knowledge of this particular piece of metal other than that he got it from two oil men, I would be pleased to know it.

Mr. BLAKESLEE.—It is believed proper for the witness to state completely the circumstances attending his coming into possession of this piece of metal, although the particular conversations concerned in such circumstance, it is admitted, are not as to themselves necessary evidence.

Testimony of Edward North, for Defendant.

Mr. North deposes and states that his name is Edward North, age 52 years, occupation—accountant. Residence, Los Angeles, California. I have had several years' experience in oil well tools, as far back as 1889. I have watched the oil [250] well production since the year of 1888. The first underreamer I saw was an Austrian reamer. It was in Los Angeles in the year 1897 or 1898. I did not see that underreamer used, nor did I use it. All I know of it was from common reports. I think I had never seen any other kind of an underreamer prior to 1899. In 1900 I rented a Swan underreamer made by the Leidecker Brothers. In Marietta, Ohio. I rented that reamer from McCrea Brothers. I just simply

(Testimony of Edward North.)

kept it in the derrick, expecting to have a chance to use it, but did not have an opportunity to use it. The casing got stuck before I was able to use it, and froze fast, and it is in there still. I could not lift up the casing far enough to use an underreamer. My next experience was one of my own invention in the summer of 1901. I tried that reamer on the Polo Solo well at Whittier. I forget the exact amount I reamed but it did the job all I needed. I patented that invention. Number of patent 674,793.

A. 24. Practically the only difference was the use of a second trip, one on the other side. This (the patent) provided for only one trip, and I found that it did not work satisfactorily on account [251] of crowding the spring-rod over against the opposite side from the trip, and I put in a trip on the other side; that was practically the only difference in it. I dispensed with that spring here in the upper part of the mandrel, as they call it, because I did not need it. That was practically the only change in it. I rented that reamer to several parties. Dave Connell used it, also a man by the name of Beck on the Silver City Petroleum Company, he used it quite a while. They paid me for the use of the reamer. I made several 5-5/8", some 7-5/8" and 9-5/8" and a 7" one, possibly two 7" reamers. They were made in between the fall of 1901 and the summer of 1902. Some of them were sold. Some were sold to the Mexican Petroleum Company, some to the Santa Fe Railway Company. The Llewellyn Brothers had a royalty contract with me.

(Testimony of Edward North.)

Q. 35. What, if any, further underreamers of this kind did you thereafter make?

A. I can't say absolutely. I have some memoranda here, if you will permit me to refresh my memory—I looked over some old books of mine the other day. Well, I mentioned the one I sold to Herron. Llewellyn Brothers had a royalty contract with me and they paid me royalties on some reamers; I don't know what they were. One of them, I believe, was the one that was shipped to the Mexican Petroleum Company. The Santa Fe Railroad Company—I mentioned that before—and I shipped one to a man in either Kansas or Indian Territory, I cannot remember now which.

Later I went into partnership with Mr. Edward Double, of the Union Tool Company, and we made some improvements on the reamer and got out a good many circulars on the subject, but I assume that he never sold any of those reamers for the reason that I never received any royalty from them. That contract was on the 11th day of October, 1904. We made a license agreement with the Union Tool [252] Company to manufacture these reamers. That agreement was as follows:

AGREEMENT.

This memorandum of agreement made and entered into this 11th day of October, 1904, by and between Edward North, hereinafter referred to as the first party, and Edward Double, hereinafter referred to as the second party, both of Los Angeles, County of Los Angeles, State of California, WITNESSETH:

THAT WHEREAS, the said Edward North has, heretofore invented certain improvements in underreamers for which letters patent No. 674,793 dated May 21, 1901, were granted to him; and

WHEREAS, the parties hereto are desirous of pushing the manufacture and sale of underreamers embodying and containing the said patent or patentable improvements, or constructions covered by said letters patent;

NOW, THEREFORE, SAID PARTIES HAVE AND DO HEREBY AGREE TOGETHER AS FOLLOWS:

1. For and in consideration of the hereinafter contained promises, covenants and agreements, on the part of the second party and the full and faithful performance of each and every part thereof, said first party does hereby sell, assign, transfer and set over unto the second party, his heirs, legal representatives and assigns, an undivided one-half in and to said letters patent and the invention covered thereby, the same to be held and enjoyed by said second party, his heirs and assigns as fully and entirely as the same might or could have been held by said first party, had this assignment not been made.

In consideration of the foregoing assignment, the second party hereto agrees to use his influence to secure a license contract with the Union Oil Tool Company for the manufacture and sale of underreamers, embodying the constructions covered by said letters patent and also to secure the manufacture and sale of [253] underreamers embody-

ing constructions covered by said letters patent, by other companies in other parts of the United States, to cause the sale and manufacture of said underreamers to be pushed and a market demand thereof supplied, not only in the State of California, but elsewhere in the United States of America.

2. IT IS MUTUALLY AGREED AND UNDERSTOOD BY AND BETWEEN THE PARTIES HERETO that they shall share equally in all benefits and advantages which may accrue from said letters patent, and shall divide equally all royalty, and all royalty contracts, and that the parties hereto shall both use their utmost endeavor to make said patent profitable and to push the manufacture and sale of said underreamers.

IN TESTIMONY WHEREOF, WITNESSETH the hand and seal of the parties hereto, the day and year first above written.

Signed EDWARD NORTH. (Seal)

Signed EDWARD DOUBLE. (Seal)

In the presence of:

LICENSE CONTRACT.

THIS MEMORANDUM OF AGREEMENT, made and entered into this 11th day of October, 1904, by and between EDWARD NORTH and EDWARD DOUBLE, hereinafter referred to as first parties, both of Los Angeles, County of Los Angeles, State of California, and UNION OIL TOOL COMPANY, a corporation organized and existing under the laws of the State of California, and having its principal

place of business at Los Angeles, and hereinafter referred to as the second party, WITNESSETH:

That whereas said first parties are owners of the full and exclusive right, title and interest to letters patent of the United States, No. 674,793, dated May 21, 1901, for UNDERREAMERS, and whereas the second party is desirous of securing a right to manufacture and use, and sell to others to be used, underreamers embodying the constructions covered by said letters patent: [254]

NOW, THEREFORE, said parties do hereby agree together as follows, to wit: For and in consideration of the hereinafter contained promises, covenants and agreements on the part of the second party and of the full and faithful performance of each and every thereof, the first parties hereby license, authorize and empower the said second party to manufacture and use and sell to others to be used, underreamers embodying and containing the constructions covered by said letters patent to the full end of the term for which said letters patent have been granted or may hereafter be extended.

FOR and in consideration thereof, the said party hereby agrees to pay to the first parties the sum of FIFTY DOLLARS (\$50) as royalty on each underreamer manufactured and sold by it embodying and containing the construction or constructions covered or secured by said letters patent; that it will render written statements monthly (on or before the tenth of each calendar month) to the said first parties, showing truly the number of underreamers manu-

factured and sold by it under this license agreement during the preceding calendar month, embodying and containing the construction or constructions covered by said letters patent; said statement in writing to be verified by oath of an officer of said second party, if so required by said first parties or either of them.

Said second party further agrees that it will pay to the first parties on or before the tenth day of each calendar month, the royalty for all underreamers sold by it under this license agreement during the preceding calendar month, and said second party agrees that it will keep full, true and accurate books and records of all underreamers manufactured and sold under this license agreement, which said books and records shall be open at all times to the inspection of each of said first parties or their duly authorized agents.

It is mutually covenanted and agreed by and between the parties [255] hereto that, in event of it becoming necessary to bring suit on said Letters Patent to protect the same from infringement, that if said second party hereto desires to bring such suit it may bring such suit in the name of the first parties, but, at the cost and expense of the second party, and that it will save the first parties harmless from all costs and expenses incurred in such suit or chargeable against said first party, by reason of any judgment in such suit against said first parties.

IN TESTIMONY WHEREOF, said first parties have hereunto set their hands and seals, and the

(Testimony of Edward North.)

second party has caused these presents to be executed in its name by its Vice-President, attested to by its Secretary, and the corporate seal hereto attached, the day and year first above written.

EDWARD NORTH. (Seal)

EDWARD DOUBLE. (Seal)

In presence of:

_____.

UNION TOOL COMPANY,
By EDWARD DOUBLE,
Its Vice-President.

Attest: DANIEL J. KOENIGSTEIN,
Its Secretary.

UNION OIL TOOL CO.

Incorporated February 23, 1901.

I produce herewith copies of circulars gotten out by the Union Oil Tool Company in regard to their reamer. They were given to me by the Union Oil Tool Company. I received a lot of them at the time, sometime within thirty or ninety days after entering into the agreement.

A. 49. The substance of it, the whole transaction was that Mr. Koenigstein came to my house one night and told me that Mr. Double wanted to see me with regard to the underreamer business. I went down and met him, and he said he believed that by making some small [256] improvements in it that he could make a good market for the underreamer, that it could be made cheaper than his own; and while he did

(Testimony of Edward North.)

not admit in so many words that it was better than his own, he said that in a great many cases he thought it would work as well, and he knew that I was not financially able to push the sales, and he thought that the agreement between us would be to our mutual advantage; and he agreed, among other things—it is in the contract there—that he would push the sales in the east as well as in California and other parts of the United States. On the strength of that and on being urged a little by Mr. Lyon, I agreed to give him a half interest in it; I did not wish to at the time; I intended to give him only half of the profits; but I was persuaded into assigning to him a half interest in the patent.

Nevertheless, I never received a royalty and presume he sold no reamers of that type.

In my opinion, his purpose was to simply sidetrack my reamer, and especially to stop Mr. F. W. Jones, who was then manufacturing a reamer which was getting on the market and which infringed my patent; evidently Jones was compelled to assign his application for patent to Mr. Double and myself and shortly thereafter he took a position working for Mr. Double as a machinist.

Mr. LYON.—We object on the ground that the ideas are merely conclusions, expressions of opinion; and that the witness should state facts; and on the further ground that it is apparent that the question calls for incompetent matters.

Mr. BLAKESLEE.—It is believed proper to adduce evidence going into the relations of the witness

(Testimony of Edward North.)

and Mr. Double pursuant to their agreement of October 11, 1904.

I have testimonials to the effect that North reamer was a thoroughly practical reamer, that is, the original, before the improvements were made. [257]

Q. 55. At the time you entered into this arrangement with Mr. Double and his company, did he point out any defects in your underreamer?

A. I believe not; I don't recollect that he did. I knew there were defects in it.

Q. 56. Did he state to you any of the improvements that he had in mind?

A. I don't remember that he did. Pardon me. I think that [258] he said, however, that there were defects which he believed he could remedy.

A. 61. The main, and in fact, the only drawback to it, after I got the second latch on, was that the reamer had to go too far below the casing before the cutters were sprung up into operative position. In some cases where there would be, as near as I could figure it out, a small cave just below the casing, the cutters would throw apart and catch, perhaps, on some protuberance there, and the weight of the tools would come down on that and pry the T-head off of the spring rod and leave the cutters in the hole. That would happen in perhaps a third of the cases where it was run. I don't believe it would be as much as that; perhaps three-quarters of the cases where the latch got below the casing before the cutters caught on anything, and the reamer worked perfectly.

While Mr. Double stated the trouble he had had

(Testimony of Edward North.)

with the North improved reamer he did not give it as a reason for stopping the work on that reamer.

Q. 66. Did Mr. Double ever make any statement to you explanatory of the fact that no payments of any nature were made to you as you have testified they were not, in accordance with the arrangement entered into by and between yourself and himself and by and between yourself and himself and the Union Oil Tool Company?

A. He did not. He stated trouble had been had, but did not give it as a reason for stopping the work.

The only reason I can advance for his discontinuing to advance or improve or sell the North under-reamer is that I understand Mr. Double gets \$50 apiece royalty on the Union reamer and he was only getting \$25 on mine. I received the information direct from Double as to the royalty he gets from the Union Tool reamer. As to the royalty on my reamer the agreements speak for themselves. Mr. Double was to receive one-half of the \$50 royalty, *and* the Union Tool Company agreed to give us on the manufacture [259] of that reamer.

Mr. LYON.—We move to strike the answer from the record and exclude it from consideration on the ground that it is hearsay, not the best evidence, and incompetent.

Q. 69. (By Mr. BLAKESLEE.) Please state such source of information as you have as to the royalties on the two reamers to which you have last referred.

(Testimony of Edward North.)

Mr. LYON.—Same objection.

Q. 73. When did you first see a Double under-reamer?

A. I should say—I can't recollect absolutely, but I should say some time in 1902. Pardon me, if this is in order; if not, the reporter will strike it out. The Double reamer got some ideas from a patent named the Brown patent and the model of the Brown patent was shown to me some time in December of 1901 by Ralph Irwin at the St. Elmo Hotel, and at that time, to the best of my knowledge and belief, no Double reamers had been manufactured. The Brown patent was impracticable in many respects. There were only few points about it which are now embodied in the Double reamer or what is called the Union reamer.

I saw Double reamers in 1904. I was around the shop a good deal at the time we made the agreement.

Q. 79. Can you state from your own knowledge a number of particular devices or apparatus used at the present day in oil well producing and name to me those that you consider of particular importance?

A. Do you mean with regard to improvements and drilling operations generally?

Q. 80. Yes, exactly.

A. There are four that have had more to do with the drilling of deep wells than anything in the history of drilling in California, namely, the under-reamer, the calf wheel, heavy pipe, and wire drilling cables. Without any one of those four it would be impossible to get to the depth that they are able to get to now. [260]

(Testimony of Edward North.)

Q. 81. Please state the part that each of these devices plays in the successful drilling of deep wells.

A. The underreamer is especially valuable in a caving formation where there are numerous shells, in other words, streaks of very hard rock which it is impossible to drive a pipe through. Under the old methods, it would be necessary to pull the entire [261] string of casing out of the hole at the risk of cavings filling up above the shell so as to interfere with using the old fashioned solid reamer. At the present time all they have to do is to lift the casing six or eight feet, run in an underreamer, which will cut a hole through the shell large enough for the casing to follow it. The calf wheel—or, as you will find it referred to in some of the oil-well supply catalogs, a second or subsidiary bull wheel—is used to save time in lifting the casing, it not being necessary to raise the tools out of the hole and go through the operation of putting through casing-blocks, and a whole lot of bother of that kind, which would take several hours. It does not take now five minutes to change from the drilling operations to lifting the casing, and that is on account of the calf wheels. The heavy pipe will stand driving and stand excessive water pressure, as the old light casing would not. And the wire lines, on account of their being smaller and heavier, will enable the tools to drop much more readily with the hole full of water, which sometimes results from a flow from beneath, and sometimes is put in in order that the hydrostatic pressure may hold the cavings back, and with the wire lines, the

(Testimony of Edward North.)

weight of the line itself will assist the tools to drop; whereas, in the case of manila lines, they help to float the tools below a certain depth. It is a very difficult matter in the use of manila lines to drill with more than three or four hundred feet of water in the hole. Now, they can drill with 2000 feet of water in the hole more readily than they could drill in the old time with 300 feet.

Q. 82. Can you recollect when each one of these features or factors of the art of well drilling came into use?

A. The first that I knew of any calf wheels being used was by J. M. Kellerman in the winter and spring of '99 and 1900. At that time Mr. Kellerman was using also an underreamer of his own device. The heavy pipe, the first that I knew of being used here, was imported by the Union Oil Company for use in Torey Canyon in 1900, possibly 1899, but my recollection is pretty strong 1900. [262] The wire cables were introduced, I believe, about 1902 or '03, can't say positively; I don't know who used them first. I presume Mr. Kellerman, as he was practically the pioneer in all new devices.

Q. 83. Will you please state what effect, if any, the introduction and use of the calf wheel and the wire rope and heavy casing had upon the use of underreamers?

A. Well, it facilitated the use of underreamers quite materially, and made possible the use of them at greater depths than they could be used otherwise.

Q. 84. And can you state in what manner they had

(Testimony of Edward North.)

this effect upon the use of underreamers?

A. The calf wheels made it much more feasible to use an underreamer on account of the great saving of time in lifting the casing. The heavy pipe was able to withstand heavy water pressures; and the wire lines enabled one to get much better results in the drilling operations on account of getting a freer fall of the tools. Perhaps I should explain there that the old method used to be, if you run on to a shell, and tried to drive your casing through it, shaving off the sides with the shoe, it had a great tendency to batter casing and perhaps lose the hole. And in many instances they would try to drive on account of its taking a couple of hours time to rig up to pull the casing, whereas, with the calf wheels, it did not take five minutes.

Q. 85. In treating of the calf wheel, the heavy casing, the underreamer, and the wire rope, and their effect upon the art of underreaming, to which, if anyone, of these factors would you attribute the greatest advantage or the most importance?

A. That is hard to say. I should say probably the calf wheel.

Cross-examination.

(By Mr. LYON.)

Q. 89. How did it happen, Mr. North, that you went to work to devise the original reamer shown in "Defendant's Exhibit North [263] Patent 674,793"?

A. I was working at that time superintending the drilling of a well up about Piru, and I had heard

(Testimony of Edward North.)

that there were reamers out, underreamers in successful use, and I had seen the Austrian, and being of a slightly inventive turn of mind, I thought I could get one that was better than those in existence.

Q. 90. Your information at that time was that there were successful underreamers?

A. Yes, sir.

Q. 91. And when was it that you were doing this drilling?

A. In 1900. The latter half of 1900.

Q. 100. Now, is it not a fact, Mr. North, that you did come to my office for the first time in reference to what terminated in these contracts, at my request directly conveyed to you, and that you knew nothing about what the subject matter was until you came up there?

A. I can't say about that. I don't think that is so.

Q. 101. And didn't I explain to you that Mr. Frederick W. Jones of Santa Paula had made what seemed to be an improvement upon the underreamer of your patent 674,793 and an infringement thereon?

A. I don't think so.

Q. 102. Will you state positively?

A. I can't state positively, but I don't think so. That matter was brought up, according to my recollection, by Mr. Double at the time we had our first talk.

Q. 103. Did you have a talk with Mr. Double in regard to that matter before you talked with me?

A. I think so.

Q. 104. That is your present recollection?

(Testimony of Edward North.)

A. That is my present recollection, yes, sir.

Q. 105. And was this contract of October 11, 1904, entered into between you and Mr. Edward Double in writing before you had canvassed the situation in regard to this intervention of Mr. Frederick [264] W. Jones to which I have referred?

A. I think not.

Q. 106. Isn't it a fact, Mr. North, that as part of the agreement between Mr. Double and yourself, he agreed to acquire and did acquire the said Jones invention and caused the same and the application for patent therefor to be assigned equally to you and to himself? A. It is.

Q. 107. Who paid the money for such assignment?

A. Mr. Double or the Union Oil Tool Company, I don't know which.

Q. 108. Do you remember how much was paid?

A. I think it was \$150; I am not sure.

Q. 109. Do you know who paid the cost of the prosecution of the application of Frederick W. Jones for patent on that improvement?

A. After that assignment it was paid by Mr. Double.

Q. 110. That was part of the agreement?

A. Yes.

Q. 111. And that application eventuated in the issuance to Mr. Edward Double and yourself of letters patent of the United States 809,570, dated January 9th, 1906, did it not?

A. I can't say as to the number. I have got the patent here.

(Testimony of Edward North.)

Q. 112. Here is a copy, if you want to look at it.

A. That is right, 809,570.

Q. 113. Now, isn't it a fact that the license agreement or contract between Mr. Double and yourself on the one part and the Union Tool Oil Company on the other part was for the purpose of manufacturing the North reamer as thus improved by Mr. Frederick W. Jones? A. It is not so specified.

Q. 114. Wasn't it talked over?

A. I don't think so.

Q. 115. Wasn't it distinctly talked over between yourself and myself at the time of drawing said instruments? [265]

A. I don't think so.

Q. 116. Will you testify that it was not?

A. I can't say positively.

Q. 117. What improvements did Mr. Edward Double make in the North reamer?

A. Did away with the latches; made the cutters in such shape that they would go down the hole without the use of latches to hold them retracted.

Q. 118. Are not those features shown in this patent to Mr. Jones, 809,570, to which I have called your attention?

A. Well, some of the features, but the Jones reamer was not the only one that had that feature.

Q. 119. Wasn't the subject matter of that improvement the Jones invention; and the doing away with the latches to which you have referred and the use of the two chambers 4 and 6, the lower chamber having a straight wall or cylindrical wall, and the

(Testimony of Edward North.)

upper chamber having an inclined or conical wall, as shown in said Jones patent? A. No.

Q. 120. Was not the reason for entering into these contracts and the acquisition of this Jones invention and the agreement by the Union Tool Oil Company to manufacture the Jones underreamer, or, as you have termed it, and the Union Tool Oil Company afterwards termed it, the improved North reamer, the fact that Mr. Double and you yourself, after this Jones invention was explained to you by me, both considered that there was a possibility of the North reamer as thus modified and particularly with the use of this double chamber to which I have referred, making the North reamer a satisfactory tool, and was not that talked over between yourself and myself prior to the drawing of the two agreements?

A. I think not.

Q. 121. Will you testify that it was not?

A. Yes. [266]

Q. 122. Do you know or have you ever been informed by anyone how many improved North reamers either the Union Oil Tool Company or the Union Tool Company manufactured?

A. There were four manufactured to my knowledge.

Q. 123. Were you not informed there were six manufactured? A. No.

Q. 124. Do you know what was done with the four?

A. Two of them were rented out, all I ever knew being done with them.

Q. 125. Were either of them ever sold?

(Testimony of Edward North.)

A. Not to my knowledge.

Q. 126. Do you know whether either of them ever gave satisfaction?

A. I know there was trouble with both of them.

Q. 127. And is it not a fact that you have been informed on more than one occasion that the reason why the improved North reamer had not been manufactured in greater quantities and had not been sold in quantities was that there was no apparent sale for it, that it was unsatisfactory? A. No.

Q. 128. You so testify under oath?

A. Yes, sir.

Q. 129. Have you ever asked either Edward Double or any officer of the Union Oil Tool Company or the Union Tool Company for a surrender of the license contract of October 11, 1904?

A. I tried to get some sort of figure on the—no, not on that. No, I have not, not of a manufacturing license. I tried to get Mr. Double's interest once in the patent; he would not sell it.

Q. 130. Or in regard to the royalty that you say Mr. Double said the Union Tool Company was paying him on his reamer, again, aren't you mistaken in that regard? Was it not when I first talked with you about this deal including this Frederick W. Jones invention that you and I discussed the question of royalty, and I told you that the [267] Union Tool Company was paying \$50 royalty on the Union or Double?

A. I have no recollection of it at all.

Q. 131. Will you testify that I did not have that

(Testimony of Edward North.)

conversation with you instead of Mr. Edward Double?

A. You may have had it, but Mr. Double had it also.

Q. 132. And that the conversation was that you would fix the royalty on the so-called improved North underreamer at the same royalty, wasn't it?

A. \$50 a piece was what was specified.

Q. 133. Isn't it a fact that at the same time the question of the acquisition of the Frederick W. Jones invention was brought up and you stated to me that you did not have and could not put any money into the acquisition of such invention?

A. That may be true; I don't know; I didn't have the money, I know that.

Q. 134. Did you not tell me that you would not invest money in that? A. I don't think so.

Q. 135. At that time you thought, did you not, and so expressed yourself to me, that modifying your original reamer of your patent number 674,793 as thus suggested by Mr. Frederick W. Jones of Santa Paula, and by him embodied in a reamer, would make a satisfactory and successful reamer of the North reamer and one which would compete with other reamers then on the market?

A. My recollection is that the Jones reamer was not considered in any way in connection with the agreement between Mr. Double and myself, with the exception of the fact that we did not wish to have an infringement suit on hand, and considered the best way to get out of that was to get Mr. Jones application, which we did.

(Testimony of Edward North.)

Q. 136. Will you testify positively that you had any portion of the negotiations eventuating in these contracts of October 11, 1904, with or that you saw Mr. Edward Double prior to the time of drawing the contracts? A. Yes, sir. [268]

Q. 137. How many times would you say?

A. I don't remember.

Q. 138. More than once prior to the drawing of the contracts?

A. I can't say. All I have in mind particularly is meeting him at his office one evening and going into the matter.

Q. 139. When did you first meet Edward Double?

A. I think in 1899, at Santa Paula.

Q. 140. Was Mr. Double at Santa Paula in 1899?

A. Yes, sir.

Q. 141. Where were you engaged in work in 1900?

A. Up until some time in June—now, I can't say positively whether the first month or two of the year I was working on the Piru ranch for David Cook or not. Subsequent to that time I was field superintendent of the Brea Canyon Oil Company in the Fullerton field, and left there about the 1st or the 15th of June to go into the upper Piru and take charge of the drilling of this Berkeley well I have referred to.

Q. 142. How many times were you in Santa Paula during the latter part of 1900?

A. I couldn't say; not very often. My business didn't call me there very much.

Mr. LYON.—That is all.